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IN THIS ISSUE

EXTREME undernutrition of large population groups in some regions of the world is recognized as one of the causes of unrest in the less favored nations. Improvement of food supplies in such areas is a major task of the Food and Agriculture Organization of the United Nations, which consequently has engaged in comprehensive studies of available foods and their distribution among various populations of the world. Data from these studies are presented in "Changes in World Consumption of Calories and Proteins Over the Last Decade" by Charlotte Chatfield, Marjorie L. Scott, and Jean Mayer, members of the Nutrition Division of the FAO. This report shows that populations have increased faster than the world supply of foods during the past decade with the result that the average amounts available per person have decreased and that the maldistribution of available supplies has become more acute.

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That tuberculosis cases increase among populations affected by serious food shortages has been demonstrated repeatedly. During World War II, large groups of the population of France were subjected to periods of semi-starvation with the usual rise in tuberculosis morbidity and mortality. Intensive studies of the nutritive state of groups of persons exposed to famine conditions, especially those in institutions, afforded data on clinical and biochemical changes that occurred on known diets and were associated with the spread of tuberculous infection. Evidence on the importance of protein deficiency in lowering resistance to tuberculosis is presented in the article on "The Relation of Protein Scarcity and Modification of Blood Protein to Tuberculosis Among Undernourished Subjects," by Jean Marche and

Hugues Gounelle who describe results of their own studies and review findings of other investigations.

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During the period 1942 to early 1947 a special experiment in the control of tuberculosis was conducted in Negro families living in the Upper Harlem area of New York City. The purpose of the experiment was to learn whether an improved nutritional status will affect the incidence of tuberculosis among persons at risk of attack because of exposure in the family. The families studied were divided into two groups: one in which vitamins and minerals were given as a supplement to the usual diet, and the other in which no vitamins were given served as a control.

The results of this study are reported in the article "An Experiment in the Control of Tuberculosis Among Negroes," by Jean Downes. This paper was one of a series presented at the Round Table on Nutrition in Relation to Health and Disease, which was a part of the Annual Conference of the Milbank Memorial Fund, November 16-17, 1949.

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The last issue of the *Quarterly* contained four of the ten papers presented at the Round Table on Modernization Programs in Relation to Human Resources and Population Problems, held in connection with the 1949 Annual Conference of the Milbank Memorial Fund. Three additional papers from this series are presented in this issue. All will be available eventually in the form of a volume constituting part of the proceedings of the Conference.

The paper "International Approaches to Modernization Programs," is contributed by Mr. H. W. Singer of the United Nations' Division of Economic Stability and Development. The author emphasizes that "the current United Nations program in this field received much support and stimulus from 'Point Four' developments in the United States." He also emphasizes, however, that the large and complex problem of rendering assistance to undeveloped areas is one that calls for international accord and an international organization. Mr. Singer describes

the present status of the expanded cooperative program of technical assistance developed by the United Nations and its specialized agencies. He urges the importance of helping undeveloped countries with their problems of world trade.

Japan's experience in modernization is worthy of special study, since she has become by far the most industrialized country of the Orient. In his paper, "Foreign Capital in Economic Development: A Case-Study of Japan," Dr. Edwin P. Reubens of Cornell University describes the manner in which Japan was able to develop *without* substantial foreign-capital assistance. Although some of Japan's aims and methods in modernization are "unpalatable," Dr. Reubens believes that the experience of this country affords implications for "Point Four" and other current programs of modernization. "There is much to be learned—to adapt and to avoid—in the Japanese methods of development and, in particular, the Japanese deployment of foreign capital."

Japan is also worthy of special attention when considering the demographic implications of modernization. In the paper, "Future Adjustment of Population to Resources in Japan," Dr. Warren S. Thompson, Director of the Scripps Foundation for Research in Population Problems, discusses Japan's prospects for increasing production and foreign trade, her chances for finding emigration outlets, and the outlook regarding her birth rate. After weighing the several probabilities as he sees them, Dr. Thompson finds himself "very apprehensive regarding Japan's future."



CHANGES IN WORLD CONSUMPTION OF CALORIES AND PROTEINS OVER THE LAST DECADE¹

CHARLOTTE CHATFIELD, MARJORIE L. SCOTT AND JEAN MAYER

IT is often stated that the world's food supply is not keeping pace with the growth of population. In particular it has been asserted that the rate at which the population of underdeveloped areas is increasing is bringing hundreds of millions of people nearer starvation, every year. On the other hand, some observers have claimed that "the world is rich" and that with careful planning, adequate research, and concerted action it will be possible not only to maintain the present per caput consumption levels despite the increase in population, but to bring about a gradual improvement in the world's nutrition. The expression of both points of view has often been tinged by emotion. A comprehensive study of facts has not usually been presented. The purpose of this article is to contribute the most reliable data available in terms of per caput food supplies at the present time as compared with the prewar period. It is of course apparent that the period covered—the last decade—cannot be regarded as representative of past or future trends. In appraising the changes which have taken place during that time, it must be remembered that it has been characterized by the most destructive war in the history of mankind. In particular, many farmers were killed, large numbers of livestock were lost, irrigation systems and water works were disrupted, and farm implements were destroyed as were many factories which produced agricultural equipment. The production of fertilizers was interrupted and the soil in many regions was consequently impoverished. On the other hand, it is estimated that during this decade the population of the world increased by an average of close to 20,000,000 people a year, from 2,174 millions in 1938 to 2,354 millions in 1948, an increase of 8.3 per cent. Table 1 gives the 1938 and 1948 populations of each continent and main

¹ From the Nutrition Division, Food and Agriculture Organization of the United Nations.

region of the world. Food supply data, whether pre or postwar, are subject to a certain margin of error. So are population figures in many parts of the world. The figures presented in this article illustrate *trends* and should not be regarded as absolute, even though they are the best figures available.

The data on available food supply² are based chiefly on information received by the Food and Agriculture Organization of the United Nations from its member governments. Each government is asked to furnish to FAO, on a yearly basis, information on production, trade, and net available supply of human foodstuffs. In the national "food balance sheets" this information is computed so as to give, on a per caput basis, the amount of each major foodstuff available for consumption. These figures are in turn translated, with the help of the FAO "Food Composition Tables for International Use," into the amounts of calories, proteins, and fats available for consumption, due allowance being made for "refuse" (though not for waste of edible material after the stage at which foods enter the kitchen). The four criteria used here in comparing the national average diets are total calories, total proteins, animal pro-

Table 1. World population: 1938 and 1948 (in millions).

	1938	1948	PERCENTAGE INCREASE
Africa	171	193	12.9
North America	141	160	13.5
Middle America	41	50	22.0
South America	87	105	20.7
Asia (Excl. USSR)	1,153	1,247	8.2
USSR (Postwar Area)	192	197	2.6
Europe (Excl. USSR)	376	389	3.5
Oceania	11	12	12.0
Total	2,174	2,354	8.3

SOURCE: Estimates prepared by FAO, based chiefly on official statistics furnished by the Statistical Office of the United Nations.

² No attempt is made to discuss actual or potential production of foods nor policies of usage and distribution of agricultural commodities. The reader is referred to "The State of Food and Agriculture, 1949" (FAO, Washington) for a more complete discussion of the subject.

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	NO. OF COUNTRIES	POPULATION (MILLIONS)
<i>Calories and Protein</i>		
Prewar	51	1,639
1948-1949	51	1,777
Change (Per cent)		+ 8.4
<i>Milk Equivalent</i>		
Prewar	46	1,581
1947-1948	46	1,710
Change (Per cent)		+ 8.2

Table 2. Number of countries and population entering into the analysis of supplies of calories, protein, and milk.

teins, and milk proteins. The aggregate population and number of countries available for comparison of national averages are shown in Table 2. Comparison of available per caput supplies of fruits and vegetables, significant though they are from a nutritional standpoint, have not been included since statistical data on fruits and vegetables are usually unreliable. Similarly, it is felt that inter-regional comparisons of fat consumption may be misleading in the present content because climate and diet patterns may modify them considerably.

The following additional observations are pertinent:

1. The physiological requirements for calories are not identical throughout the world, in particular because of differences in climate. However, it will be readily seen (Figure 1) that differences in available calories throughout the world are of a completely different order of magnitude from possible differences in calorie requirements due to variations in physiological needs.³

It may be further noted that above a certain level (often put at 3,000 calories) variations in calorie consumption probably reflect differences in waste and degrees of "over consumption" rather than variations in supplies needed to satisfy physiological requirements. This may not apply, however, to extremely cold countries.

³ The Nutrition Division of FAO convened in September 1949, an international expert committee on energy requirements to consider proposals of methods of calculation of calorie requirements taking into account such factors as climate and protection against environmental temperatures, age distribution of population, modes of activity, body size of adults, etc.

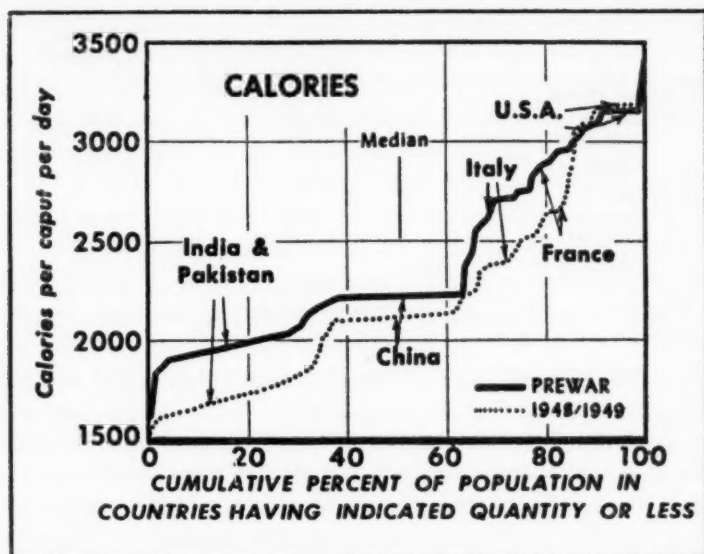


Fig. 1. Cumulative per cent of population in countries having indicated quantity of calories or less in the prewar period and in 1948-1949.

2. Differences in the consumption of total proteins are not as striking as differences in consumption of other nutrients. However, it may be noted that even between countries with an equally low consumption of animal proteins, e.g. China and India, there are large differences in the consumption of vegetable proteins which may have considerable nutritional significance.

3. The consumption of animal proteins has often been regarded as an excellent index of the state of nutrition, not only because they contribute to the diet those amino acids most likely to be lacking in vegetable proteins, i.e. lysine, methionine, threonine, and tryptophan, but also because consumption of animal proteins generally varies in the same direction as consumption of B vitamins and most minerals.

4. Milk has been chosen as a basis of comparison because of its importance in the nutrition of certain age groups, i.e. infants, children, pregnant and nursing women. It has been deemed preferable to use milk protein rather than total milk for the purpose of this comparative study as the nutritional significance of milk

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in human diets is associated with its proteins, minerals, and water-soluble vitamins rather than with butter fat. The variations recorded for milk consumption do not, therefore, reflect total milk production since an important proportion of milk diverted to butter manufacture and animal feeding was modified in the postwar period by such factors as government restriction and subsidies, consumers' demand, etc.

The charts presented here are "cumulative distribution curves." They have been drawn so that the abscissa of a point represents the percentage of the total population having an amount equal to or less than the quantity represented by the ordinate of this point. Countries are plotted in the order of increasing supply and the ordinate of the medium of the segment of the curve representing a given country corresponds to the average available supply for this country, while the projection of this segment on the axis of abscissae is proportional to the population of the country.

The total population covered represents slightly more than 75 per cent of the total population of the world. The largest single unit which is not included is the Soviet Union; the other main area on which our information is incomplete is constituted by the dependent territories in Africa. It is felt, however, that these two deficiencies do not affect too seriously the validity of our conclusions on the comparative increases of food supplies and populations. Both areas are, generally speaking, sparsely populated and possess great potentialities for the development of food production.

The data presented as "prewar" represent an average of the last three or four prewar years (1935-1939). As far as "post-war" is concerned, for most of the countries they are based on 1948-1949. However, for a few countries, notably in Asia, the figures are based on 1947-1948 or 1947 data. A few names of countries typical of various consumption levels are placed on the charts for purposes of illustration.

All the curves show that supplies of calories, proteins, and milk for a high proportion of the total population of the world

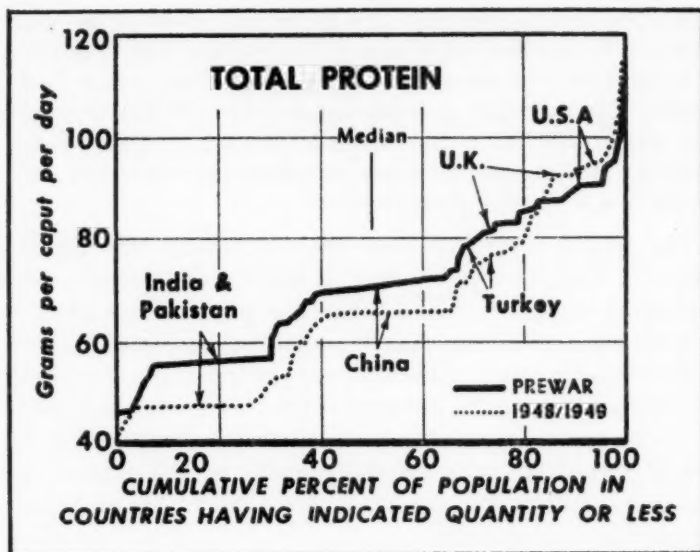


Fig. 2. Cumulative per cent of population in countries having indicated quantity of total protein or less in the prewar period and in 1948-1949.

remain at low levels, and, further, that the disparities in distribution have widened in recent years. At the left hand of each curve which covers the poorest countries, quantities have generally decreased, or at best have remained stationary. Small differences at the extreme lower end may be more serious than larger differences at relatively better levels.

Figure 1 shows that 22 per cent of the total population was formerly at or below the level of 2,000 calories; this proportion is now 35 per cent. Similarly, the proportion at or below 2,500 calories has risen from 65 per cent to 75 per cent. Whereas 77 per cent of the population obtained less than 2,800 calories before the war, there are now about 85 per cent in this category. At the median, i.e. 50 per cent of the population, the calorie level now is about 2,120, as compared with 2,240 prewar. The aggregate calorie supply for all countries increased by less than 1 per cent so that, with an 8 per cent increase in population, the

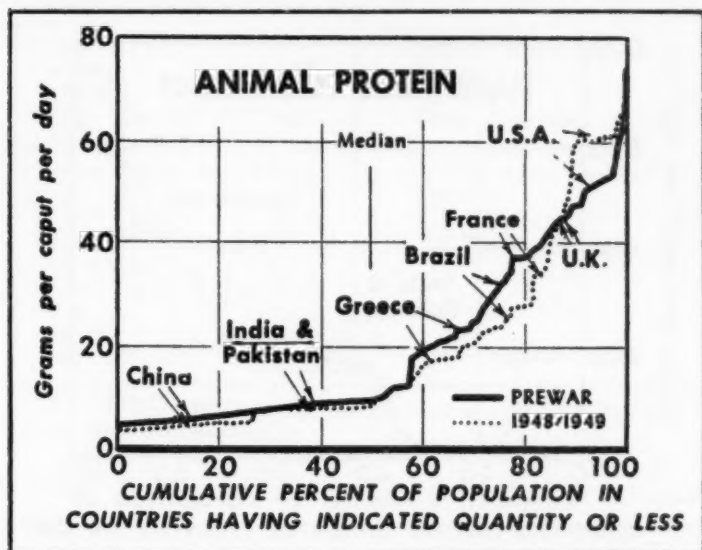


Fig. 3. Cumulative per cent of population in countries having indicated quantity of animal protein or less in the prewar period and in 1948-1949.

per caput average of 2,220 calories is lower than the prewar average 2,390 by about 7 per cent.

Figure 2 shows that less protein is available to more than 80 per cent of the population than in the prewar period. This is due to reduction in the per caput supplies of grains as well as animal foods. At the median point in population the protein level is about 66 grams, as compared with 71 grams prewar. The aggregate protein supply has increased by less than 2 per cent. The per caput averages 66.2 and 70.7 respectively are practically the same as the median values and correspond to a 6 per cent decrease.

From the nutritional standpoint the shifts in animal protein supplies shown in Figure 3 are probably even more significant and more serious than those in total protein although, naturally, the changes are smaller in absolute terms. At the median, the level is only about 8 grams in both periods. There has been a general decrease for most countries which consumed in the pre-

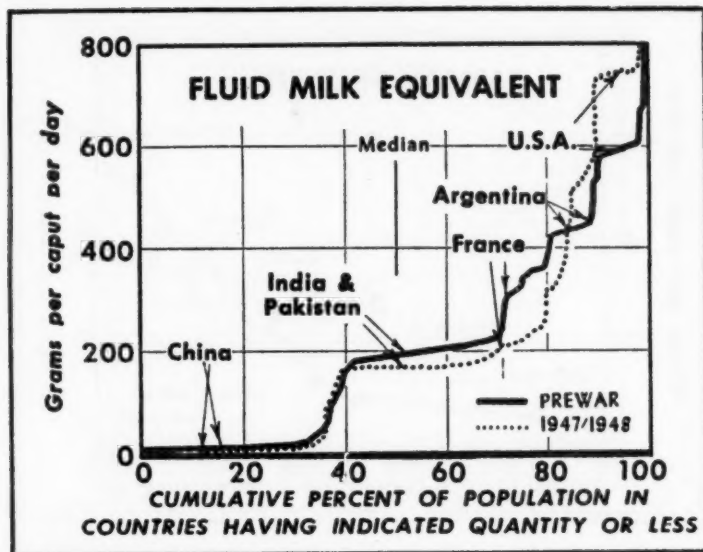


Fig. 4. Cumulative per cent of population in countries having indicated quantity of fluid milk equivalent or less in the prewar period and in 1948-1949.

war period only 3 to 9 grams per day, as well as for those which had 19 to 42 grams per day. At the upper end of the curve there have been appreciable gains. In 1948-1949 the aggregate quantity for all countries was 2 per cent above prewar, but the average quantity per caput was 18.5 grams as compared with 19.6 grams per day prewar, i.e. a drop of 6 per cent.

World distribution of milk products is shown in Figure 4 in terms of the fluid milk equivalent, based, as explained previously, on the grams of milk (3.5 per cent protein) which would provide as much protein as the total of all dairy products consumed. The figures covering 46 countries are mainly for 1947-1948; they were estimated in a few cases from 1947 data, for one country from 1946 data. As in Figures 1 to 3, the contrasts are sharp between the most and the least favored countries; more of the population than prewar now consume less than 200 grams per day and more consume less than 300 grams per day. The percentage having more than 700 grams per day has

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<i>Calories</i>		<i>Animal Protein</i>	
(Trillions per Day)		(Thousand Metric Tons per Day)	
Prewar	3,913	Prewar	32.2
1948-1949	3,940	1948-1949	32.8
Change (Per cent)	+0.7	Change (Per cent)	+1.9
<i>Total Protein</i>		<i>Milk Equivalent</i>	
(Thousand Metric Tons per Day)		(Thousand Metric Tons per Day)	
Prewar	116.0	Prewar	321
1948-1949	117.6	1947-1948	341
Change (Per cent)	+1.4	Change (Per cent)	+6.2
<i>Vegetable Protein</i>			
(Thousand Metric Tons per Day)			
Prewar	83.8		
1948-1949	84.8		
Change (Per cent)	+1.2		

Table 3. Aggregate amounts of calories, protein, and milk equivalent available for human consumption.

increased. At the median point, the present level of 165 grams per day contrasts with the prewar level of 190 grams per day. The aggregate supply represents a gain from prewar of about 6 per cent, i.e. almost as much as the gain in population (8 per cent). The average per caput quantity is thus nearly the same as in the prewar period, i.e. about 200 grams per day.

Two main conclusions can be derived from this comparative study. The first one is that the decade during which the second world war took place has been marked by an aggregate increase in supply of calories and proteins of 1 to 2 per cent (Table 3), an increase in population of 8 per cent and therefore a resultant decrease in per caput food supply for the world at large of about 6 to 7 per cent (Table 4). That period, it has been noted, was characterized by widespread destruction of agricultural facilities as well as by an increase in world population of 200,000,000. Second, the effect has been felt very unequally according to regions. Generally speaking, regions with a low consumption status have sunk even lower while countries where food situation was good have maintained themselves or improved.

We do not intend in this article to take sides with the optimists or with the prophets of doom. But we hope that the

CALORIES			
<i>Median</i>		<i>Average</i>	
(Number per Caput per Day)		(Number per Caput per Day)	
Prewar	2,240	Prewar	2,390
1948-1949	2,120	1948-1949	2,220
Change (Per cent)	- 5.4	Change (Per cent)	- 7.1
TOTAL PROTEIN			
<i>Median</i>		<i>Average</i>	
(Grams per Caput per Day)		(Grams per Caput per Day)	
Prewar	71	Prewar	70.7
1948-1949	66	1948-1949	66.2
Change (Per cent)	- 7	Change (Per cent)	- 6.4
VEGETABLE PROTEIN			
		<i>Average</i>	
		(Grams per Caput per Day)	
		Prewar	51.1
		1948-1949	47.7
		Change (Per cent)	- 6.7
ANIMAL PROTEIN			
<i>Median</i>		<i>Average</i>	
(Grams per Caput per Day)		(Grams per Caput per Day)	
Prewar	8	Prewar	19.6
1948-1949	8	1948-1949	18.5
Change (Per cent)	0	Change (Per cent)	- 5.6
MILK EQUIVALENT			
<i>Median</i>		<i>Average</i>	
(Grams per Caput per Day)		(Grams per Caput per Day)	
Prewar	190	Prewar	203
1947-1948	165	1947-1948	200
Change (Per cent)	- 13.2	Change (Per cent)	- 1.5

Table 4. Calories, protein and milk equivalent available for human consumption—per person per day.

data presented here will allow any discussion on food supplies and populations to be on a more documented basis. Finally, attention may be called to the fact that inequality in the distribution of food may be an even more serious problem, from the nutritional standpoint, than insufficiency in total supplies.

SUMMARY

1. Data are presented on prewar and postwar aggregates, averages and distribution of food supplies available for human

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consumption for approximately 75 per cent of the world's population.

2. During the decade 1938-1948 there has been a rise in the population of about 8.3 per cent and rises in the aggregate supplies of calories, total protein, vegetable protein, animal protein and milk protein ranging from 0.7 per cent to 6.4 per cent.

3. The average net available supply per caput has therefore decreased by the corresponding difference.

4. Maldistribution of available supplies according to regions has become more acute during this period.

THE RELATION OF PROTEIN SCARCITY AND MODIFICATION OF BLOOD PROTEIN TO TUBERCULOSIS AMONG UNDERNOURISHED SUBJECTS

JEAN MARCHE AND HUGUES GOUNELLE¹

RECENT studies, particularly those of Cannon, have demonstrated that the proteins, and more especially the globulins, play a major role in the defense and immunization processes of the body. It is believed that a diet deficient in protein and the resulting decline in the total plasma globulin are factors in the lowered resistance to infections. The observations on tuberculosis which we were able to make in France during the occupation, from 1940 to 1945, indicate such a relationship and it is of interest to report them briefly.

Tuberculosis and War. Numerous statistics show that there is always a serious increase in tuberculosis during periods of war. The experience of France particularly demonstrates this point.

During the War of 1870-1871, mortality from tuberculosis rose in Paris from 528 per 100,000 persons in 1868-1869 to 664 in 1870, and to 737 in 1871; then it fell to 468 in 1872. In the days after the Siege of Paris it may be stated that famine and tuberculosis, following each other, caused more deaths than the war and the riots of the revolution.

The same change took place during the First World War, when the total deaths from tuberculosis per 100,000 population rose from 213 in 1913 to 273 in 1918 (a rise of 28 per cent) and declined to 220 in 1920. The change was particularly evident in the occupied territory of northern France, where the lack of food was great. For example, at Lille, tuberculosis mortality rose from 315 per 100,000 in 1914 to 573 in 1918. Mouriquand, Breton and Ducamp (1), reporting on this subject at the 5th International Tuberculosis Congress in Strasbourg in 1923, stressed the essential role of undernourishment in the occur-

¹ Centre de Recherches de l'Hôpital Foch de Paris. An address given at 96 Boulevard Raspail, Paris, France.

rence of tuberculosis during the war. This was observed also in other countries, both belligerents and neutrals.

Table 1 shows the death rates from tuberculosis registered in various European countries from 1913 through 1922. The increase in tuberculous infection during the war years is evident, and as K. Faber (2) has emphasized rightly, there is a definite relation between these fluctuations and the changing food situation in each of these countries.

During the Second World War the same situation developed. Tuberculosis was rampant in France as soon as food rationing began. It was first manifested by a notable increase in cases of exceptional severity among members of groups in institutions, lunatic asylums, and prisons who were subject to strict rationing measures. It then appeared among the general population but more especially among those living in cities. We shall not mention all of the studies devoted to the subject, but we shall present a few of the more significant findings.

Paris. In studying the rates for newly-diagnosed cases of tuberculosis which were bacteriologically tested and diagnosed in seventeen dispensaries of the Social Hygiene Department of the Seine Division, an official organization for the diagnosis and treatment of tuberculosis, Troisier (3) noted that the total rate rose from 141 in 1938 to 176 per 100,000 population in 1942, an increase of 24.8 per cent.

At the National Committee for the Fight Against Tuberculosis and in a speech given during the same period at the Academy of Medicine in Paris, Moine and Boulenger (4, 5) stressed

Table 1. Mortality from tuberculosis (all categories) per 100,000 population, 1913-1922.

COUNTRY	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
Germany	142	143	148	162	206	230	211	154	137	142
Italy	156	145	157	166	175	209	172	160	142	143
Holland	141	140	144	168	181	203	173	147	127	115
Great Britain	134	136	147	146	151	157	126	113	113	112
Denmark	135	138	132	155	176	138	119	117	107	101
Sweden	232	238	245	235	227	208	200	186	168	165

the fact that tuberculosis was a menace to the French people. They reported that the number of cases of tuberculosis² per 100,000 persons in Paris rose from 315 in 1939 to 455 in 1941, and that the death rate in the Paris District rose from 155 in 1939 to 214 in 1941. These figures, which were reported by a highly-qualified statistician from information obtained from important Health Services about a great many cases exposed to maximum privation, are of greater value and interest than the national statistics. The latter also show a definite increase in the tuberculosis mortality rates in 1941 and 1942, but the errors in them in both directions were so great that little faith can be accorded them.

In our rural areas, statistics for cases of tuberculosis and causes of death generally were always difficult to establish precisely. During the occupation the clandestine way of life (underground, etc.) of a large number of young people and the stratagems utilized to avoid deportation of many of them further contributed to inaccuracies in these statistics. Moreover, the food situation in rural areas was not modified by the war, with the exception of the rural part of southeast France.

On the whole, statistics, especially those for towns, agreed with reports by clinical observers at the end of the first year of occupation and undernourishment that *cases of tuberculosis were abnormally numerous and particularly grave at that time and frequently resulted in death within a few months.*

The Role of Nutrition. Divers factors have been mentioned to explain the spread of tuberculous infection observed during periods of social upheaval, particularly during periods of war: migration of peoples, moral sufferings, and *especially undernourishment*. We agree with M. Bariety (7) that the exodus of peoples brings about undesirable promiscuity and a rapid dissemination of infectious diseases; we also agree that psychological factors produce somatic effects that are beyond dispute, and that overtiring is still more harmful to un-

² The figures were taken from diagnoses made in the dispensaries of the Social Hygiene Department.

dernourished persons. However, we believe, as do the majority of French and foreign authors, *that nutritional deficiency is the prime factor.*

We shall not dwell at length upon the problem at this time. We shall indicate, however, those points that support the factor of undernourishment. They may be envisaged from various aspects.

(a) *Individually.* Whatever the cause, tuberculosis is remarkably frequent among persons who are undernourished. Various authors, M. Labbé in particular, have emphasized the frequency of tuberculosis among the obese who have been submitted to reducing cures.

(b) *Collectively.* In lunatic asylums, where tuberculosis caused a considerable number of deaths, the psychological factor could not be taken into consideration, and general living conditions, other than dietary, had not become modified. This was true in the institution where we conducted part of our research. P. Bourgeois (6) reported that tuberculosis cases rose 50 per cent from 1938 to 1943 in the sanatorium of a psychiatric institution where all conditions, including heating, other than dietary remained unchanged. Therefore, it appeared to him that undernourishment was the only responsible factor. On the other hand, M. Bariety (7) was able to observe illness and death from tuberculosis among personnel of the Paris fire brigade. These men, who were submitted to regular and intense physical activity and to frequent overtiring because of bombardments, were entitled always to an exceptionally large and well-balanced ration. Among that group sickness and death from tuberculosis remained the same as that registered before the war.

(c) *Regionally.* In France during the occupation, as in Denmark in 1916 and 1917 and in Germany in 1917 and 1918, tuberculosis increased in towns, especially large towns, but it did not spread in rural areas. What is more, in certain regions rich in food production, as in Brittany, it was noted that tuberculosis diminished.

(d) *Nationally.* During the First World War, deaths from tuberculosis increased greatly in *neutral* countries such as Denmark or Holland when food became scarce. In England, the mortality rate from tuberculosis increased only at a much later time and to a slight degree. Even though this was a *belligerent* country food was available in sufficient quantities for nearly the whole duration of hostilities.

Comparing tuberculosis mortality among the French populations in the various categories for rationing, L. Bourgeois, M. Fourestier, and Mlle. della Torre (6) made the following interesting observations in 1944: Among young children (Category E) whose official energy ration was 38 per cent above the vital minimum, tuberculosis mortality showed a decrease of 10 per cent in 1941 over 1938; however, among children of school age (Categories J-1 and J-2) whose ration was 23 per cent below the vital minimum, tuberculosis mortality showed an increase of 100 per cent.

Personal Research. Following a great deal of research on food, health, and biology among various groups (8, 9) we tried in 1944 to estimate the time when tuberculosis spread menacingly among the groups under observation, and to determine which were the principal food and biological conditions causing this spread. We present the facts we observed and the conclusions we reached (10).

Table 2. Average nutrient content of diets of various groups.

Groups	NUTRIENTS FURNISHED			
	Calories	Protein—Gm.		
		Total	Animal	Vegetable
Minimum Physiological	2,400	70.0	30.0	40.0
X Prison, April, 1941	1,437	46.3	0.6	45.7
S.M. Lunatic Asylum, April, 1941	1,436	54.0	18.0	36.0
Adults, Paris, 1941	1,804	63.8	21.5	42.3
65 Families, Paris, 1941	1,764	67.3	24.2	43.1

^a Only the total amount was noted.

1. *Beginning of the Increase in Tuberculosis.* This took place in the spring of 1941 after a particularly hard winter during which it became more and more difficult to obtain food. In the preceding autumn family reserves were exhausted and clandestine shipments of food had not yet become organized. That was the "rutabaga" winter during which our compatriots had to live within the official ration of 1,200 calories and thus lost from 10 to 15 kilos. All statistics show that the general death rate, as well as that from tuberculosis, rose suddenly and considerably during May and June, 1941.

We had occasion to observe these facts in a very precise way (8, 9). Research work was carried on in April, 1941, in a prison in the provinces and in a big lunatic asylum of the Paris region. This research was done because of the considerable loss of weight of the inmates. A few weeks later there appeared among these groups, almost simultaneously and very extensively, edema, hypoglycemia, pellagra, and then *acute tuberculosis* or, in other words, the main signs of famine pathology. The diet and biological research carried on during the previous month made it possible for us to know precisely what conditions brought about the development of these disorders, particularly the many cases of tuberculosis.

2. *Dietary Conditions.* The average amounts of calories and of various nutrients supplied by the diets of four different

BY THE DIETS OF SPECIFIED GROUPS

Fat—Gm.			CHO Gm.	Calcium Mg.	Vitamin A I.U.	Ascorbic Acid Mg.
Total	Animal	Vegetable				
40.0	25.0	15.0	420	840	6,000	70
10.7	0.0	10.7	289	345	129	69
22.0	"	"	256	395	6,710 ^b	191
42.1	27.9	14.2	292	464	—	—
42.1	35.0	7.1	277	546	4,215	65

^b Includes carotene.

groups are shown in Table 2, as well as the amounts of these nutrients supplied by the minimum physiological diet.

The chief characteristic of the Parisians, taken as a group in apparently good health, was a double deficiency in carbohydrates and calories, the second being mainly the consequence of the first. But since the fat and protein content was low, the diet appeared almost balanced in spite of its insufficiency (Gounelle and Mande) (15).

The carbohydrate deficit in the diets of inmates of prisons and asylums (tuberculosis candidates) was similar to that of Parisian families but the fat and protein contents were much lower, resulting in a reduction of the energy value to a total (1,435 calories) equivalent to famine. In addition these diets were completely unbalanced since the lipids and proteins of vegetable origin were greater than those of animal extraction.

The ration for the Parisians, as for the incarcerated, contained a theoretically sufficient quantity of vitamin B and ascorbic acid but it was deficient in A, D, and niacin. What actually characterized the ration of these persons was an important deficit in lipids and proteins of animal origin.

3. *Biological Conditions.* Research conducted in 1941 among various classes of the French population revealed vitamin deficiencies which were clinically invisible but biologically evident. The determination of vitamin A, niacin, and ascorbic acid in the blood of a large number of persons showed generally lower values than those which can be considered normal. The lowest values were noted usually among the incarcerated, but identical results were found often among persons supposed to be in good health and who came through the whole of the occupation period without notable pathological incidents (11). The total lipids and cholesterol in the blood were found normal or a little lowered among all of the subjects examined.

Among the determinations for blood constituents, only the modification of blood proteins appears to characterize the state of malnutrition favoring the development of the usual manifestations of famine pathology and especially of tuberculosis. This

question has been discussed in detail by Gounelle. Therefore, only the points which appear essential will be presented here.

(a) As Gounelle, *et al.* (9) pointed out when they conducted research among the inmates of prisons and asylums in 1941, the first modification of the blood protein balance is a decline in the total globulin. The value is generally less than 2.0 gms. per cent and frequently less than 1.5 gm. On the other hand, the serum albumin total is nearly always normal at this stage. The result is a slightly lower amount of total protein and an abnormally high albumin-globulin ratio. As we have indicated many times since that period, the drop in plasma globulin appears to be the earliest symptom of protein deficiency, preceding the appearance of edemas characteristic of the state in which famine tuberculosis develops. One may even wonder if this globulin deficiency is not the state of least resistance to infections which is always evident in cases of malnutrition. Recent work related to the physiology of the globulins and the studies of Cannon (12) argue in that direction.

(b) At a more advanced stage of famine, the decline in serum albumin may be considered characteristic. The total globulin is normal or slightly higher at this time, resulting in a low total protein and a decline in the albumin-globulin ratio. It is the usual characteristic of a state of malnutrition with edema.

Certain biological and clinical characteristics of famine tuberculosis were demonstrated by M. Bachet and J. Marche (13) in 1943 and have been noted by various observers since. In conditions of undernourishment complicated by tuberculosis, the protein content of the blood is very specific; the total serum albumin is subnormal or very low, while the total serum globulin is abnormally high, as in the case of infections of all types. As a result, the total protein often appears normal but there is a considerable lowering or an extreme inversion in the albumin-globulin ratio. This modification is so characteristic that we automatically looked for tuberculosis when, upon examining an

undernourished subject, we found a high total globulin or a progressive rise after several determinations.

Clinically, famine tuberculosis is characterized both by its gravity (frequency of miliary and bronchopneumonic forms) and by its torpidity (minimum of general signs) and also by its exudative tendency. As Bachet and Marche (13) have shown, there is frequently a pleuro-pulmonary tuberculosis with pleuritic fluid in the foreground and with a chronic evolution independent from that of edemas. Bariety and Barrabé (7) also have emphasized the frequency of interminable inflammations of serosa which occurred among repatriated persons during the same period. After the liberation of persons interned in Germany several observers noted similar findings. It is probably a fact that the modifications in the protein balance and a disturbance of the metabolism of water coupled with undernourishment play a part in the appearance of these forms of tuberculosis.

On the whole, the real characteristic was the decline in the total globulin in the blood of undernourished persons who were tuberculosis candidates. Following that, a decline in serum albumin indicated a serious malnutrition, while a rise in globulin usually accompanied the development of tuberculosis. These tests, which were carried out solely on the basis of loss of weight, demonstrated that a deficiency in fats and proteins and a drop in plasma globulin were the two most outstanding conditions among the persons threatened with famine tuberculosis.

It appears useful to point out which of the two, fat or protein, is the more dangerous deficiency. Certain facts tend to prove that the protein ration plays the more important role.

The Brittany Experiment. Until 1939 the Brittany departments were taxed heavily by tuberculosis. The morbidity and mortality rates from tuberculosis there were the highest in France and even in Europe. Alcoholism was considered to be the principal cause of this situation. However, during the war tuberculosis declined perceptibly in this region of France while it increased everywhere else. This fact, which was observed by

local doctors, was confirmed completely by statistics. For example, in the Cotes-du-Nord department where we personally did research on the subject, tuberculosis caused 257 deaths per 100,000 population in 1938. Although there were no notable shifts in the population, mortality dropped to 189 in 1941 and to 156 in 1942. The same favorable change took place in various departments whose population is essentially rural. Our research in this region in 1943 revealed the following facts: Alcoholism had not diminished there; the Breton peasants drank as much cider and "eau-de-vie" (cognac) as they did in 1938 since they produced both. However, food habits had become radically changed. Because of the clandestine slaughtering of cattle, the intake of red and fresh meat had become customary and had been substituted for pork and especially for lard, which until that time had been the principal meat products in the diet. In addition to this, we must emphasize the fact that the intake of cereals, of green vegetables, and of milk products remained as abundant during the war as previously.

The observations in Brittany should be compared with those found in a village of the Morvan in France by Ch. and F. Flandin (14). Tuberculosis cases were numerous there from 1890 to 1914. The exodus to towns by the young people and the infectious contacts resulting from this appeared to be responsible. At that time peasant life was rather poor and the diet was composed principally of lard and vegetables, butchered meat being eaten not more than once a week. But during the period from 1919 to 1939, although the exodus to towns continued and the contaminating contacts were multiplied, tuberculosis practically disappeared in this village where no anti-tuberculosis measures were taken. By carrying on research in this part of France where they were born, Ch. and F. Flandin tried to explain these circumstances. The only explanation that they found was the change in the eating habits of the peasants. After their return from the First World War the men regularly ate fresh meat which since that time has been a part of the regular diet of the population.

The Danish Experiment (2). In 1914, Denmark, a cattle-raising country, was supported by exports to Germany and England of its meat, milk, butter, cheese, and eggs. At the request of its buyers and in order to obtain basic necessities, Denmark considerably increased its exports in 1915. Fresh meat remained an important part of the diet, averaging 40.9 kg. per person per year; but in cities butter disappeared, the average intake falling from 8.1 kg. to 3.3 kg., and an epidemic of keratomalacia from avitaminosis A occurred. Because of a great increase in exports in 1916, products of animal origin became scarcer than ever and very expensive in the towns. The intake of butter remained low and that of fresh meat literally crumbled, being 3.2 kg. and 26.2 kg., respectively, per person per year. The cases of avitaminosis A remained numerous and a new factor was added. Cases of tuberculous edema showed a tremendous increase especially in the towns. Deaths from tuberculosis per 100,000 persons were 155 in 1916 and 176 in 1917 compared with 135, 138, and 132 in 1913, 1914, and 1915.

After the blockade had stopped exports in 1917 and feed for cattle had become scarce, the intake of butter and fresh meat became normal again, averaging 9.9 kg. and 44.7 kg. The effect was felt rapidly. In 1918 keratomalacia entirely disappeared and tuberculosis mortality declined to 138. On the other hand, this was the year of greatest scarcity in the rest of Europe.

These interesting statistics, established with a great deal of precision for a small country relatively isolated from the rest of Europe, demonstrated *a priori* that the lipid and protein deficiencies were the chief factors in the increase in tuberculosis observed in 1916 and 1917. Since there was no scarcity of carbohydrates before 1917, the energy ration remaining unchanged throughout the war period, it is evident that an insufficient caloric content of the diet could not be blamed, nor could the scarcity of vitamin C. Furthermore, when a new "butter crisis" was brought about by large exports in 1920, the intake of butter in the country again dropped to 3.3 kg., as in 1915. Cases of avitaminosis A became more numerous but an increase in tu-

berculosis did not appear, the death rate remaining very low (117 per 100,000 persons).

K. Faber who analyzed this situation with the greatest of care and reported these data, did not hesitate to conclude that the rise in tuberculosis in Denmark in 1916 and 1917 was only transitory, corresponding with the period of scarcity in fresh meat, and that the scarcity in protein of animal origin was the cause of this incident. The facts which we have observed are in agreement with these conclusions.

General Conclusions. Tuberculosis is one of the manifestations of famine pathology. A deficiency in animal proteins appears to be an essential determining factor in this situation. Our research indicates this and is in accord with the study of tuberculosis in Denmark during the First World War.

A decrease in the total plasma protein, especially globulin, is usually found for persons whose diets are deficient in animal protein. This condition is possibly a factor in the state of lowered resistance which brings about the development and the severity of the tuberculous infection.

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AN EXPERIMENT IN THE CONTROL OF TUBERCULOSIS AMONG NEGROES

JEAN DOWNES¹

THE most important tuberculosis problem at present is the control of the disease among Negroes. In 1939-1941 the death rate among nonwhite persons in New York City was 208 per 100,000 population, compared with a rate of 41 among white persons (7). It is generally recognized that most of the Negro population in any given community are living on the lowest economic level. This implies environmental conditions associated with poverty, poor housing, and inadequate income for food, clothing, and other necessities.

Since tuberculosis mortality does vary with the level of living of groups of the population, and since nutrition is an important environmental factor determined to a considerable extent by the level of living, it seemed important to conduct an experiment to learn whether an improved nutritional status and by implication a higher level of living will affect the incidence of tuberculosis among persons at risk of attack because of exposure in the family. This particular experiment was conducted in Negro families in Harlem.

The importance of environment when considering tuberculosis has been brought out by various persons interested in the subject. Frost (8) said: "Probably nothing has been more influential in bringing about the decline of tuberculosis than progressive improvement in the social order as a whole; and nothing, perhaps, is more essential to the further effective control of the disease than to hold up, and so far as possible to improve the standards of living of the lower economic strata. . . . It is probable that one of the most important factors in the decline of tuberculosis has been progressively increasing human resistance, due to the influence of selective mortality and to environmental improvements such as better nutrition and relief from

¹ From the Milbank Memorial Fund, the Community Service Society, and the Bureau of Tuberculosis of the New York City Department of Health.

physical stress, tending to raise what may be called nonspecific resistance."

The marked increase in tuberculosis which followed World War I and again after World War II has demonstrated that populations forced to live on the border of starvation are especially susceptible to the spread of the disease among them. It is recognized that malnutrition is not the only cause of the increase in tuberculosis. Holm (9) indicates the causes of the great increase in tuberculosis in Europe after World War II as: greater opportunity for the spread of tubercle bacilli because of the disorganization of the whole anti-tuberculosis program in many European countries, overcrowded living conditions in the large cities, malnutrition, the low standard of every-day hygiene, because of the nonexistence of facilities for hygiene, and the psychic pressure under which the population has lived.

The experience of Great Britain during and after World War II has demonstrated that an environmental factor, good nutrition, is a most important factor in building up and preserving general resistance to disease and death. There the government took measures to ensure an adequate amount of food for everyone without regard to income.

Magee (10) in a discussion of some lessons of the war in the application of nutrition to public health describes the effect upon tuberculosis as follows: "In regard to tuberculosis, the circumstances altered appreciably for the worse in the early part of the war. Many patients who in peacetime would have remained in sanatoria were sent home to make room for anticipated air-raid casualties. Many of these tuberculous people may have become infective after discharge, and the increase in the incidence of, and death rate from, tuberculosis in 1940-1941 was not surprising. The death rate was 635 per million in 1938; it had risen to 699 in 1940, but had reached the lowest level ever—583 per million—in 1944. The incidence was 50,689 in 1938, 54,300 in 1943, and practically the same in 1944. The increased incidence is unquestionably, to some extent, a measure of improvement in ascertainment rather than in real incidence. As-

certainment was improved by the medical examination of large numbers of young people for military service, and by the introduction of mass radiography.

"Tuberculosis has always flourished where there is poverty or famine, and it is generally believed that poor food is the dominant factor. . . . During the First World War the death rate from tuberculosis rose from 1,340 per million in 1913 to 1,694 in 1918, whereas it decreased during the Second World War. In a recent review Leitch has brought forward evidence indicating that diet plays a dominant part in maintaining the body's resistance against tuberculosis. There is therefore good reason to believe that the well-balanced diet during the war did a great deal to prevent increased mortality from tuberculosis."

In a recent animal experiment Dubos (11) has shown that "Both in the susceptible and in the more resistant strains, the course and outcome of the disease are markedly affected by the environmental conditions under which the animals are kept during the infectious process. Thus, the susceptibility of mice to tuberculosis can be greatly modified by changing the composition of the diet fed the animal during, or before, initiation of the infectious process."

DATA AND METHOD OF STUDY

The special nutrition experiment was set up in an area of upper Harlem, comprised of some thirty-five city blocks, extending north from 142nd Street to 156th Street, and west from the Harlem River to Eighth Avenue. Thirty-two thousand Negroes in 9,116 household units lived in this area (12).

Improvement of nutritional status was to be achieved by increasing the daily intake of nutrients; that is, by giving needed vitamins and minerals as a supplement to the usual diet. This experiment required that two groups of families or populations be studied, one in which supplements were given and the other a control for comparison with the experimental group.

It is relatively easy to set up a control for comparison with an experimental group. However, there are certain rigid re-

quirements which must be met if the experiment is to have validity. The requirements are as follows:

1. The control population must be similar in all essential respects to the experimental population except for the specific factor introduced into the latter.
2. The observation of results must be comparable for the control and experimental populations.
3. Relevant data capable of evaluation and statistical analysis must be obtained for both populations with equal care and exactness.

A consistent effort was made throughout the period of study to meet the requirements which have been described.

Sampling. Eligibility of the families considered for the study was carefully defined. 1. Exposure to active reinfection tuberculosis in the family was essential for admission to the study. To reduce variations in the factor of familial exposure, the index or active tuberculous case must be a related member of the family unit. 2. One or more of the family members must have an examination for objective rating of nutritional status.

In December, 1941, there were 218 families under public health supervision which met the first requirement of the special study. Members of these families were invited to have a nutrition examination. One or more members of 194 families were examined at the nutrition clinic.

The 194 families were divided into two groups of equal size; one, the vitamin group in which nutrients in the form of vitamins and minerals were given as a supplement to the diet; the other, a control group in which no supplements were to be dispensed.

In the selection of the families for the two groups, age constitution of the population was considered a factor of importance because the incidence of tuberculosis is known to vary with age. To control the factor of age, the families were matched according to size and allocated alternately to the control and vitamin groups. This method of matching the families by size and plac-

ing them alternately into the two groups excluded personal judgment.

At the beginning of the study (early in 1942), the two groups of families were examined for comparability with respect to sputum status of the index case and the age distribution of the population at risk of developing tuberculosis.

There had been exposure to known positive sputum in a similar proportion of the families in both groups; namely, 84 per cent of the vitamin families and 83 per cent of the control families.

The two groups of families were found to be homogeneous also with regard to age constitution. More than half the number in each group had children under 16 years of age in them. Families with only adults, 25 years of age or older, formed about one-fourth of each group.

Data of the Study. Throughout the five years of the special study both groups of families were visited with the same frequency; that is, once a month for the first three years and once every three months thereafter. Detailed records concerning the social and economic condition of each family were obtained and at later visits any changes in these conditions were noted. The data collected were as follows: The individuals who made up the household were listed. The place and date of birth, length of residence in New York City, present employment status, and relationship to the head of the household were indicated for each person in the household. Cause of death, place of death, and date of death were listed for all deceased members of the family. Non-resident members of the family living in institutions were also listed. Nature of employment was obtained for all employed persons. Data were obtained also as to the amount and source of income, and the amount paid for rent. At monthly intervals information was obtained concerning the amount spent for food and the types of food eaten by the family during the preceding week.

Attention was given to all known health problems in the family. Persons suffering with chronic disease other than tu-

berculosis were listed and a record was obtained of medical care, both clinic and hospital care, received by these persons.

Abstracts of the tuberculosis clinic examinations were obtained for all members of the tuberculous families who had such examinations.

A study of the incidence of all illness during a twelve-month period was conducted in the tuberculous families included in the experimental group. Sickness records were collected at monthly intervals. The onset and duration of illness, the onset and duration of disability, the number of days confined to bed, and the number of days in the hospital were recorded on a special form on a calendar basis.

In addition to the record of illness, the families were asked to report all preventive medical care, such as immunizations and vaccinations, check-up examinations for chronic disease, prenatal and well-baby care. Also a record of all eye care and of all dental care was obtained.

Records of all types of medical service rendered to members of the families were checked against the records of the clinic or hospital where the service was given. The records for the few cases attended by private physicians were submitted to them for confirmation or correction only when this was necessary in order to permit the best public health nursing supervision of the case.

PUBLIC HEALTH TEACHING IN THE FAMILIES

It was thought best not to alter the usual program of public health instruction given to the families by the nurses. Rather, throughout the period of study a consistent effort was made to maintain the same standard of teaching in both groups of families.

The teaching program included the following points: The need for improved food habits for the entire family, attention to acute or chronic illness and the need for medical care for such illness, and the importance of the tuberculosis chest clinic examinations. The nurses also gave attention to the social and

economic problems of the family because their aim was to assist when needed any family in its efforts to maintain the family unit.

A most important part of the supervision of the tuberculous families was that given by the Upper Harlem Chest Clinic. Dr. Neville C. Whiteman was chief of the medical staff of the clinic throughout the period of the study. The diagnosis for essentially every examination of persons in the special study was reviewed and verified by Dr. Whiteman. Consequently, the data on tuberculosis are not subject to variations between different examiners.

EXAMINATION OF IMPORTANT ENVIRONMENTAL FACTORS PRESENT AT THE BEGINNING OF THE SPECIAL EXPERIMENT

Tuberculosis as an Environmental Factor. In a study of the incidence of tuberculosis in a population exposed to special risk of the disease, the tuberculous environment both past and present must be scrutinized with care. Table 1 shows the annual

Table 1. Annual attack rate from tuberculosis among persons exposed to special risk in Negro families.

SPECIFIED STUDY	RATE PER 100 PERSON YEARS	NUMBER OF PERSON YEARS
Harlem (1938-1941)		
Vitamin Group	2.14	468
Control Group	2.32	431
Philadelphia (1924-1929) ¹	2.71	2,767
Williamson County, Tennessee (1931-1941) ²	2.05	1,315
Lee County, Alabama (1920-1937) ³	1.10	3,897
Kingston, Jamaica, B.W.I. ⁴	2.3	3,166

¹ Putnam, Persis: Tuberculosis Incidence Among White Persons and Negroes Following Exposure to the Disease. *The American Journal of Hygiene*, November, 1936, Vol. 24, No. 4.

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⁴ Ople, Eugene L.; Putnam, Persis; and Seward, E. Joyce: The Fate of Negro Persons of a Tropical Country, Jamaica, B.W.I., After Contact with Tuberculosis. *The American Journal of Hygiene*, February, 1941, Monographic Series No. 16.

FAMILY GROUP	TOTAL DEATHS PRIOR TO 1942	NUMBER OF DEATHS	
		1939-1941	Prior to 1939
Vitamin	46	34	12
Control	42	29	13

Table 2. Tuberculosis deaths before January, 1942—upper Harlem area of New York City.

attack rate from tuberculosis among persons at risk in Negro families. The attack rates for the Harlem families, shown first in the table, are for the period 1938-1941; that is, before the beginning of the experiment being reported upon. The rates for the control and vitamin groups were fairly similar. Therefore it may be concluded that they were comparable with respect to past exposure to infection in the family.

Annual attack rates among persons exposed to risk of infection in Negro families are shown also in Table 1 for a study made at the Henry Phipps Institute in Philadelphia (13), for rural areas in Tennessee (14), Alabama (15), and for Kingston, Jamaica, in the British West Indies (16).² It should be noted that, excepting Lee County, Alabama, the rates are on the same general level and are similar to those recorded for the Harlem families. From the epidemiological point of view these data indicate that familial aggregation of tuberculosis among Negroes has been approximately the same over a period of time and that urbanization has not greatly affected the level of the attack rates. This point has special significance when considered in relation to the objective of the Harlem experiment; that is, to see if a change in the environment will modify a familial risk of disease, a risk which was not unique for the Harlem families.

Table 2 shows the tuberculosis deaths which had occurred in

² There are differences in the method of analysis of the various studies. In Philadelphia, in Lee County, and in Jamaica, the experience begins with the first known exposure to sputum positive tuberculosis within the household and contains events ascertained by inquiry and those noted while the households were under observation. In Harlem and in Williamson County, exposure to a given type of index case is considered and experience includes only those events occurring during the period of observation.

In spite of the differences in the character of the material and the method used, the data are sufficiently similar to warrant the general comparison presented in Table 1.

FAMILY GROUP	PER CENT	NUMBER OF CASES	POPULATION
REINFECTION TUBERCULOSIS (PERSONS AGED 10+)			
Vitamin	22.6	68	301
Control	21.2	62	293
PRIMARY INFECTION (PERSONS AGED 0-24)			
Vitamin	25.5	40	157
Control	26.2	39	149

Table 3. Prevalence of living cases of tuberculosis, 1942—families in upper Harlem area of New York City.

the vitamin and control families before 1942. These data afford another indication that the intensity of exposure to tuberculous infection in the family was similar for both groups.

Table 3 shows the prevalence of living cases of reinfection tuberculosis and primary infection demonstrable by x-ray among family members at the beginning of the special study. The two groups of families had comparable rates for both types of cases.

Position of the index case in the family may be considered as an indication of possible variations in the intensity of exposure to infection in the family; that is, the tuberculous mother in the family may be supposed to have had more intimate contact with her children than the father. Figure 1 (Appendix Table 1) shows the position of the index case in the family. The differences between the two groups are not great; in 89 per cent of the vitamin and 81 per cent of the control families the index case was the husband, wife, or child.

It may be concluded from the data presented—familial attack rates, number of tuberculosis deaths, prevalence of living cases, and position of the index case in the family—that prior to the beginning of the nutrition experiment the families were comparable with respect to a most important environmental factor, opportunity for exposure to familial tuberculosis.

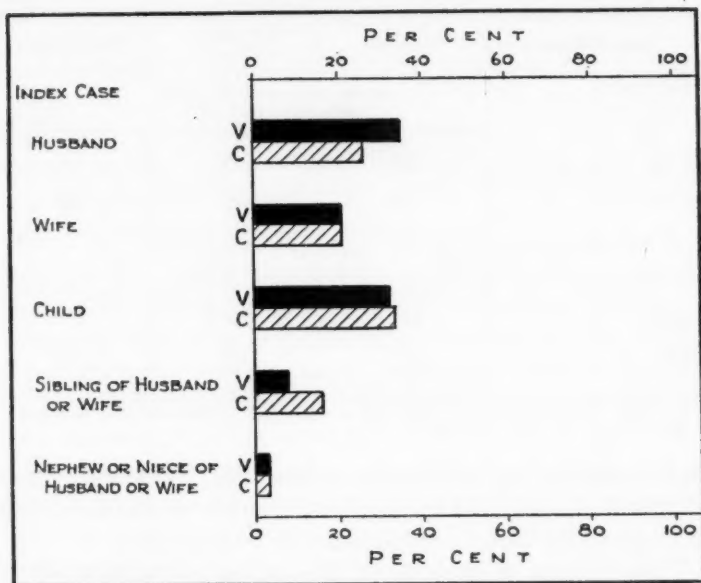


Fig. 1. Distribution of vitamin and control families according to position of the index case in the family—upper Harlem area of New York City.

Socio-Economic Environmental Factors. Individual resistance to progressive tuberculosis is believed to be affected by the socio-economic environment of the individual or the family. It is important, therefore, to examine the two groups of study families to ascertain their comparability with respect to important environmental factors.

Figure 2 (Appendix Table 2) shows the source of income for the vitamin and control families at the beginning of 1942. From 61 to 65 per cent in both groups were dependent on public assistance which is indicative of a low level of living.

Figure 3 (Appendix Table 3) shows the distribution of the families according to a composite rating on food habits at the beginning of the study.³ From 40 to 50 per cent of the families had food habits rated as marginal or unsatisfactory. It should

³ The rating on food habits was based on the standards recommended by the Food and Nutrition Board of the National Research Council. See Appendix 2.

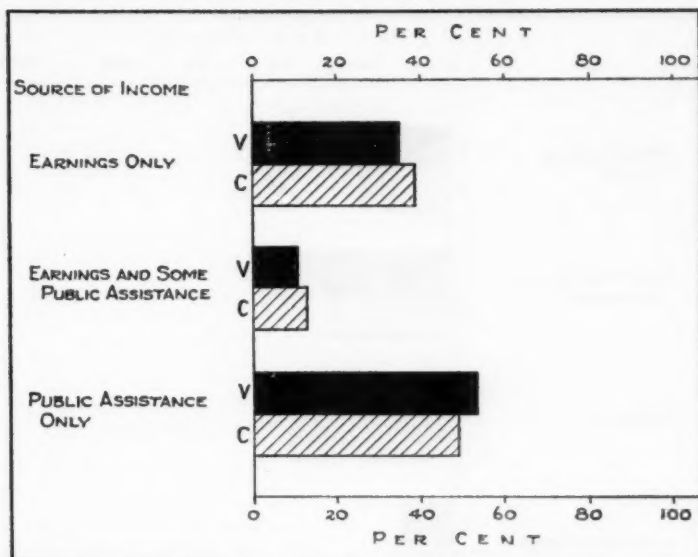


Fig. 2. Distribution of families according to source of income, 1942—upper Harlem area of New York City.

be explained that teaching good food habits had since 1939 been an important part of the public health nursing program in tuberculous families in the study area of upper Harlem (1-6).

The distribution of the families according to the degree of crowding is shown in Figure 4 (Appendix Table 4). The crowding rating for the family takes into consideration the number of rooms in the living quarters in relation to the age and sex content of the family.⁴ From 50 to 54 per cent of the families in the two groups were living in very crowded quarters; they were rated unsatisfactory or very unsatisfactory.

It may be concluded that at the beginning of the nutrition experiment the vitamin and control families were generally similar with regard to source of income, food habits, and crowding, all socio-economic factors which may have a bearing upon the spread of tuberculosis among their members.

⁴ The crowding rating is described in detail in Appendix 2.

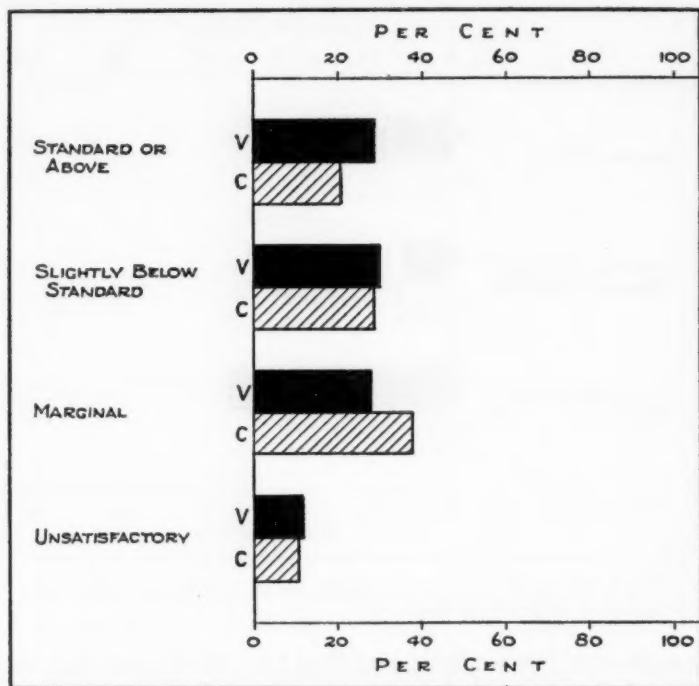


Fig. 3. Distribution of families according to composite ratings on food habits, 1942—upper Harlem area of New York City.

The presence of chronic illness other than reinfection tuberculosis among family members is of interest. Table 4 shows the number of cases of specific chronic conditions in each group of families. In each, these persons with chronic illness constitute about one-fourth of the population at risk of developing tuberculosis. These cases were reported to the nurses who asked routinely about chronic illness in the family and all were substantiated by medical records.⁵ Examination of the diagnostic categories reveals that the degenerative diseases and venereal disease formed the majority in both groups. There were four

⁵ It should be emphasized that the data in Table 4 comprise only cases known to the family. Examination of the total population would no doubt reveal more cases. Cases of "old syphilis" where the medical record stated that no further treatment was needed have been excluded.

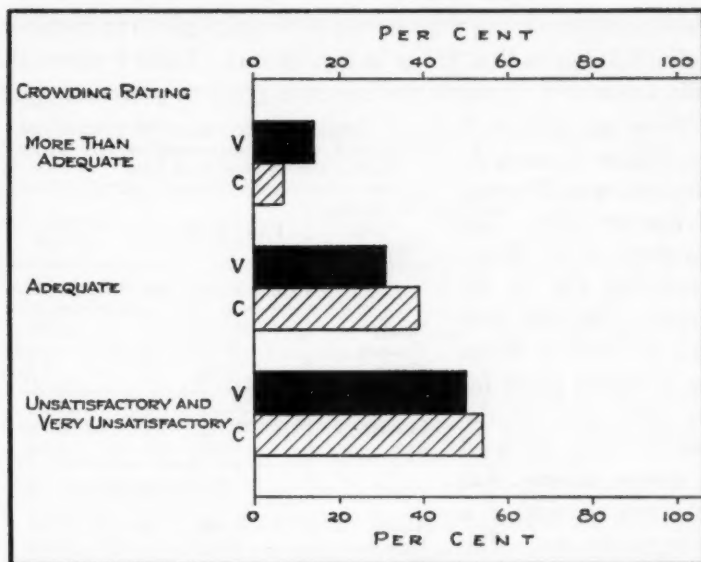


Fig. 4. Distribution of families according to degree of crowding, 1942—upper Harlem area of New York City.

persons in each group of families who were permanently disabled with a chronic condition.

Attack Rate from Tuberculosis, 1942-1947. Before a discussion of the attack rates during the five-year period of study, a

Table 4. Number of cases of chronic disease, 1942—families in upper Harlem area of New York City.

DIAGNOSIS	NUMBER OF CASES	
	Vitamin Families	Control Families
TOTAL	60	54
Heart Disease	12	11
Hypertensive Vascular Disease	10	6
Venereal Disease	9	6
Arthritis	6	5
Diabetes	1	4
Psychoses	6	5
Psychoneurosis	3	3
Rheumatic Fever	0	2
Other Causes	13	12

statement concerning the amount of vitamins given to members of the families in that group is appropriate. Table 5 shows the daily amount of vitamins and minerals given to persons in each of three age groups: 6 months to 4 years, 5-12 years, and 13 years and older. The amounts were determined by Dr. H. D. Kruse. The first column of Table 5 shows the amounts given for the first year of the special study; the level of dosage during that year was considered a therapeutic one. The amounts given in subsequent years, shown in the second column of Table 5, were considered those needed for daily requirements or maintenance.^{6, 7}

The vitamins and minerals were dispensed at the nutrition clinic; a month's supply for each member of the family was given to the housewife or another responsible member of the family each month. All instructions concerning the taking of

Table 5. Daily amount of vitamin and mineral supplements—families in upper Harlem area of New York City.

VITAMINS AND MINERALS	FIRST YEAR	SUBSEQUENT YEARS
CHILDREN 6 MONTHS TO AGE 4		
Niacin	30 mg.	4.0 mg.
Thiamin	3 mg.	.5 mg.
Flavin	3 mg.	.5 mg.
Vitamin A	10,000 I.U.	1,500 I.U.
Ascorbic Acid	75 mg.	20 mg.
Calcium	100 mg.	500 mg.
Iron	9 mg.	3 mg.
5-12 YEARS OF AGE		
Niacin	75 mg.	15 mg.
Thiamin	6 mg.	1 mg.
Flavin	6 mg.	1 mg.
Vitamin A	20,000 I.U.	3,000 I.U.
Ascorbic Acid	225 mg.	50 mg.
Calcium	250 mg.	500 mg.
Iron	21 mg.	6 mg.
13 YEARS AND OVER		
Niacin	150 mg.	20 mg.
Thiamin	9.9 mg.	2 mg.
Flavin	9.9 mg.	3 mg.
Vitamin A	50,000 I.U.	5,000 I.U.
Ascorbic Acid	375 mg.	75 mg.
Calcium	500 mg.	500 mg.
Iron	45 mg.	6 mg.

⁶ All new-born infants in the vitamin families were given vitamins at the therapeutic level for one year without regard to the amounts being taken by other members of the family at the time of the infants' birth.

⁷ The vitamins and minerals used during the first year of the special study were purchased from Mead Johnson and Company, Evansville, Indiana. Those for the four subsequent years were purchased from E. R. Squibb and Sons, New York, N. Y. Both companies furnished the material at lower-than-usual cost and thus made a contribution to the study.

FAMILY GROUP	RATE PER 100 PERSON YEARS	NUMBER OF CASES	NUMBER OF PERSON YEARS
<i>Vitamin</i>			
(1) Took Vitamins	0.16	1	644.5
(2) Took no Vitamins	0.50	3	598.5
Control	0.91	10	1,096.5
	DIFFERENCE	STANDARD ERROR	PROBABILITY
C and V1	0.75	± 0.396	.05 to .06
C and V2	0.41	± 0.446	.35 to .36

Table 6. Annual attack rate from tuberculosis, 1942-1947—families in upper Harlem area of New York City.

the vitamins were given by the supervising nurse of the nutrition clinic. Follow-up teaching with respect to the supplements was done by the field nurses who made home visits.

All members of the families in the vitamin group were urged to supplement their usual diet by the addition of vitamins. However, 27 per cent of persons in these families were unwilling to take any vitamins; in the second year the proportion not taking vitamins rose to 46 per cent, and by the end of the fifth year 60 per cent were not taking vitamins. Consequently, to study the incidence of new cases of tuberculosis in these families it is necessary to separate the population at risk into two groups—those who did take vitamins and those who did not. The transfer of persons from the vitamin group to the no-vitamin group was made on what was believed to be a conservative basis. Transfer was made only after an interval of six months from the time that the person had stopped taking vitamins.⁸

The number of new cases of tuberculosis which occurred in the three populations at risk are shown in Table 6⁹. One case occurred among persons taking vitamins. This case was a widowed female aged 23 whose husband died of tuberculosis in April, 1942. The patient had a chest x-ray in May, 1942, which was considered negative for tuberculosis. In March, 1943, after

⁸ No persons who stopped taking vitamins and minerals resumed the taking of them.

⁹ The method of analysis and the formula for the calculations in Table 6 follows that formulated and presented by Frost in 1933 (17).

ten months of observation, she was found to have active reinfection tuberculosis. During the ten months of observation the patient took a five months' supply of vitamins.

There were three new cases among the persons in the vitamin group of families who either took no vitamins or ceased taking them after a relatively short period of time. One of the cases in this group was a male aged 17 at the beginning of observation. He had three negative examinations including an x-ray of the chest. In December, 1943, he entered the Navy and was discharged two years later. At that time he was still negative for tuberculosis. A year later, in December, 1946, he was found on x-ray examination to have active pulmonary tuberculosis. This patient took vitamins for a period of six months before going into the Navy and refused to take them when he returned from the Navy.

The second case occurred in a male aged 48. This patient had four routine x-ray examinations, all of which were negative for tuberculosis. In February, 1946, he died of acute miliary tuberculosis. He took vitamins during the first twelve months of the study and was observed for three years while not taking vitamins.

The third case occurred in a male aged 19 at the beginning of observation. This patient took no vitamins. During the first year of observation he had three chest x-ray examinations all of which were negative for tuberculosis. He was out of the household for three years; on his return his x-ray examination was negative for tuberculosis. Seven months later he was re-examined and found to have minimal pulmonary tuberculosis.

In the control families there were ten new cases during the period of observation; four were males and six were females. One male was aged 27; two were in the age group 35-39; and one was aged 56. The females were generally younger than the males; three were under 25 years of age; one was 30; and the remaining two were over 45 years of age.

Two of ten cases were diagnosed as active pulmonary tuberculosis on their first x-ray examination during the period of ob-

servation. The remaining eight were negative on their first examination; three were diagnosed on second examinations; three on a third examination; and one had a total of four negative chest x-rays before a diagnosis of tuberculosis was made. The last case was diagnosed as healed primary infection when first observed. The diagnosis remained the same for five subsequent examinations; on the sixth examination there was evidence of an active minimal lesion of reinfection type tuberculosis. The new cases all occurred in different families.

The lower section of Table 6 shows the difference between the rates in the vitamin families and the control group. The difference between the rates for the controls and for persons who took vitamins is of borderline significance; that is, the chances of such a difference being due to sampling are from 5 to 6 out of 100. On the other hand, the difference between the rates for persons who took no vitamins and for the control population was definitely nonsignificant.

CHANGES IN ENVIRONMENTAL FACTORS DURING OBSERVATION

Both the vitamin and the control families were found to be generally similar at the beginning of the nutrition experiment with respect to the tuberculous environment and to socio-economic conditions of the family. In view of the difference in the attack rates of new cases of tuberculosis in the two groups of families, it is proper to present data which reveal changes in environmental conditions which took place during the period of observation. It is also most necessary to learn whether measures for the detection of new cases were applied with equal force in the populations of the two groups of families.

Continued clinic supervision of the study group, including periodic x-rays of the chest, was considered of the utmost importance. Table 7 shows the frequency of these examinations. Sixty per cent of the persons in the vitamin families were examined at least once in each year compared with 52 per cent in the control families. Twenty-one and 31 per cent, respectively, were examined at least twice during the five years. The

FREQUENCY OF CHEST X-RAY	PER CENT	
	Vitamin Families (293 Persons)	Control Families (286 Persons)
TOTAL	100.0	100.0
Every 6 or 7 Months	20.9	23.3
Every 8 or 9 Months	15.3	11.5
Every 10-12 Months	23.4	16.7
Every 13-18 Months	8.9	11.5
Every 19-24 Months	10.6	6.2
Every 25+ Months	20.9	30.8
Not Examined	11.3	15.0

Table 7. Frequency of chest x-ray examinations among persons at risk, 1942-1946—families in upper Harlem area of New York City.

proportions unexamined during that period were 11 per cent of persons in one group compared with 15 per cent in the other group. About one-third of the unexamined in each group had negative chest x-rays before the beginning of the special study.

Familial Exposure to Tuberculosis. Familial exposure to tuberculosis during observation may be modified by hospitalization of active cases and deaths among these cases. Table 8 shows that there were 40 active cases in each group of families. Most of these cases had some hospital care; the mean months of care per case was similar for patients in both groups of families. The number of deaths were 23 in the vitamin families compared with 28 in the controls. Admittedly, these data afford only a crude measure of opportunities for exposure to infection in the

Table 8. Cases of active reinfection tuberculosis classified according to hospital care and mortality, 1942-1946—families in upper Harlem area of New York City.

CLASSIFICATION	VITAMIN FAMILIES	CONTROL FAMILIES
TOTAL CASES	40	40
Hospital Care	37	39
Months of Hospital Care	394	403
Months Per Case	10.6	10.3
Deaths	23	28

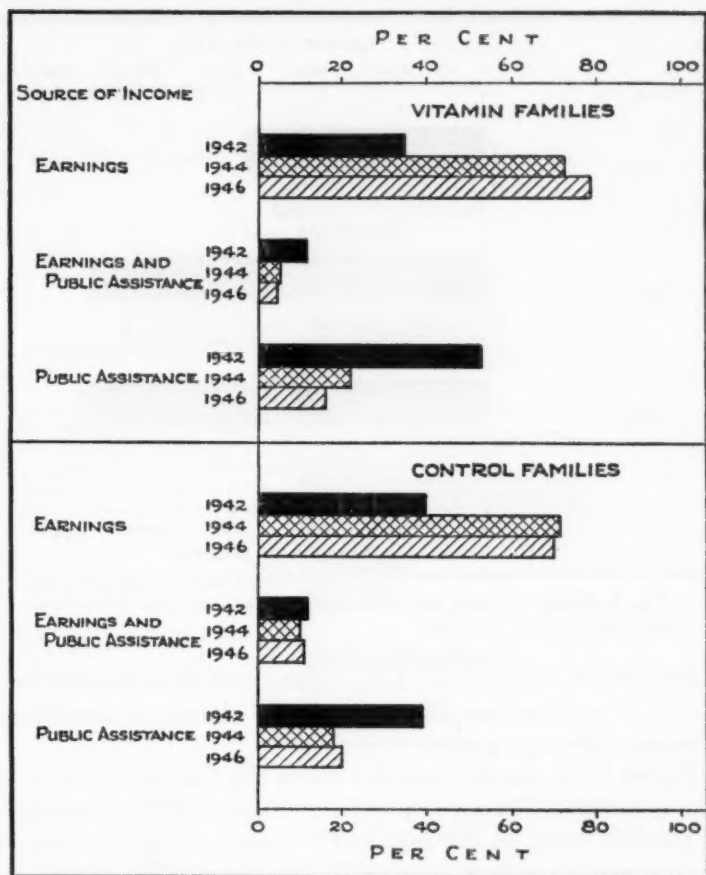


Fig. 5. Change in source of family income, 1942-1946—upper Harlem area of New York City.

family. However, the data are of the same order for both groups and they do suggest that there were no important differences between the two groups.

Socio-Economic Environment. There were marked changes in the socio-economic environment of the families. This was not surprising since the period of observation, 1942-1946, coin-

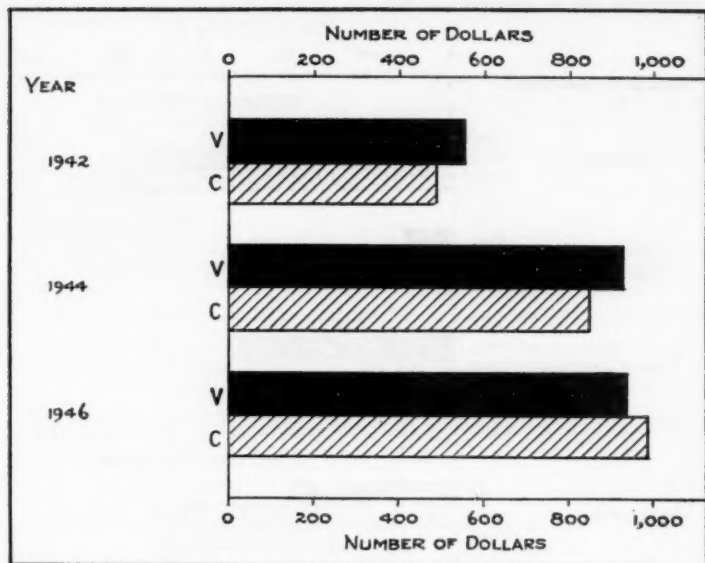


Fig. 6. Change in mean annual income per cost unit, 1942-1946—upper Harlem area of New York City.

cided with the war period. It is important to note whether one group of families was affected more by change in conditions than was the other group.

Figure 5 (Appendix Table 5) shows the change in source of family income. There was a striking increase in the proportion of families living on earnings and a corresponding decrease in the per cent dependent upon public assistance. This was due to increased opportunities for employment. The two groups of families were similar with respect to change in source of income.

As would be expected, the change in mean annual income per cost unit was equally as striking for the two groups of families.¹⁰ These data are shown in Figure 6 (Appendix Table 6). Here again the two groups of families were fairly similar. The increase in the mean annual income, from 73 to 89 per cent, in

¹⁰ Income is expressed in cost units because this method allows for the relative cost of maintenance of children and adults.

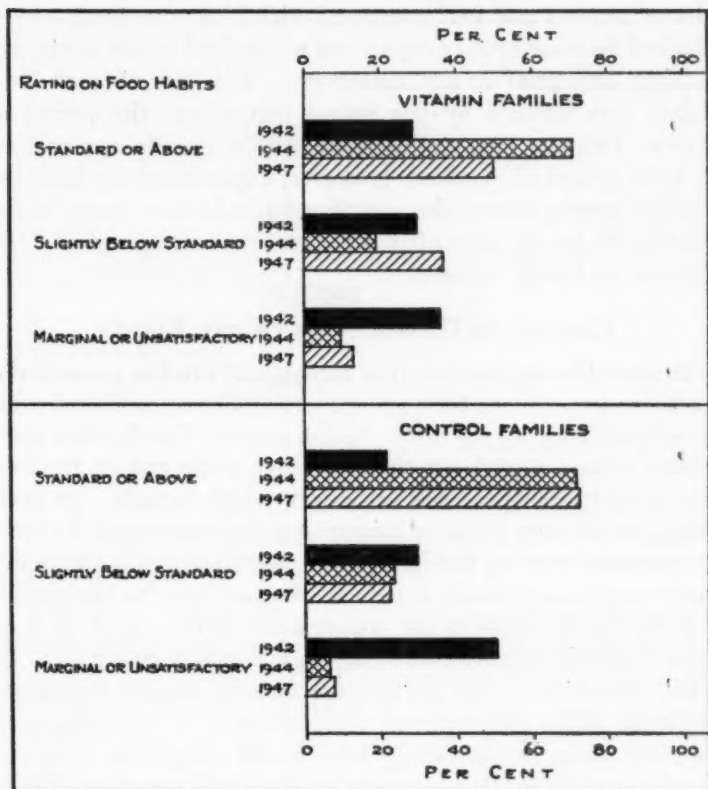


Fig. 7. Change in rating on food habits, 1942-1947—upper Harlem area of New York City.

these families was considerably greater than the increase in the cost of living during the period 1942-1946.¹¹

There was also a marked change in the families with respect to their rating on food habits. These data are shown in Figure 7 (Appendix Table 7). The ratings refer to the spring months of 1942, 1944, and 1947. Both vitamin and control families showed an increase in food patterns classed as "standard or

¹¹ According to the Consumer Price Index for New York City (United States Bureau of Labor Statistics), the cost of living determined from retail store prices rose 46 per cent during the period under consideration.

above" in 1944 and 1947 compared with 1942; there was a very marked decrease in the proportions where food habits were considered "marginal or unsatisfactory." Teaching of good food habits was stressed by the nurses throughout the period of study. This teaching was supposed to be equally emphasized in both groups of families. However, expenditure for food increased greatly during the period and the decisive factor in attaining the results presented in Figure 7 was without doubt the increase in family income.

CHANGES IN CONSTITUTION OF THE FAMILY

It should be emphasized that throughout the five years of the nutrition experiment both groups of families were visited with equal frequency by the public health nurses. The families were visited once a month for the first three years and in the last two years visits were made once every three months. On each visit, records were obtained concerning the make-up of the family; persons entering the family were recorded and inquiry was made concerning family members who had left the household.

Preliminary study of the tuberculous families in Area 8 of upper Harlem indicated that they were a mobile group (4). In a twelve-month period the average moving rate for household units was 30 per 100 observed. Consequently, it was recognized that the movement of family units would complicate close supervision of them. However, all families in the nutrition experiment were followed regardless of any change in place of residence unless the family moved away from New York City.

The annual moving rate of the vitamin and control families was 25.4 and 26.1 per 100, respectively. Figure 8 (Appendix Table 8) shows the proportion of families in each group according to the number of family moves. The two groups were quite similar with respect to moving. About 40 per cent in each group did not move during observation and 34 per cent moved two or more times. The families moved chiefly to Washington Heights and the Bronx. A few moved to lower Harlem, to Queens, and to Brooklyn.

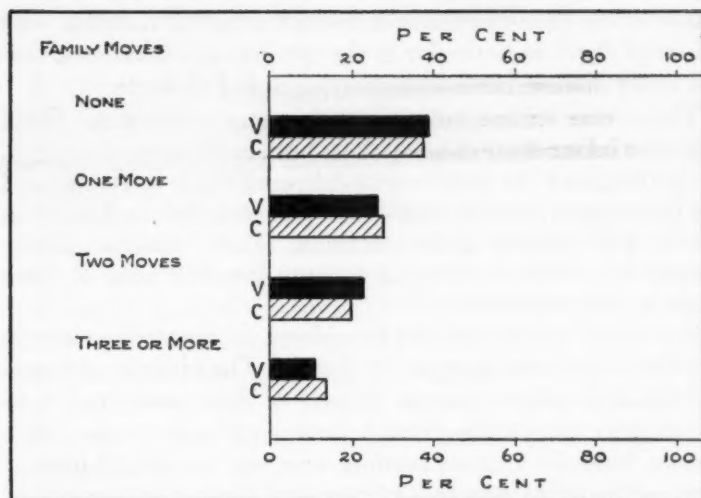


Fig. 8. Distribution of families according to number of moves of households during five years' observation, 1942-1946, 1947—upper Harlem area of New York City.

It was considered highly desirable to keep the members of the families who moved out of Area 8 of upper Harlem under the continued supervision of the Upper Harlem Chest Clinic and the Nutrition Clinic. Consequently, the cost of their transportation to and from the clinics was met by the special study budget.

During the five years' observation, eight of the vitamin families and ten of the control families moved away from New York City.

Family units do not remain constant with respect to their membership. Whenever a member who had been exposed to active tuberculosis in the home moved out of the family unit and established a household, this new household was also visited with regularity. A total of 128 different family units were supervised in the vitamin group; in the control group the total was 125.

Changes Within the Family. During the five years of observation there were, excluding infant deaths, ten deaths from

causes other than tuberculosis in each group of families. The causes of death were similar in the two groups—accidents, cancer, heart disease, cerebral hemorrhage, and diabetes.

There were sixteen births in each group of families. There were two infant deaths among those born in the control families. In one instance the mother was delivered while eclamptic and the infant survived only two days. The other infant death was due to a congenital heart condition. There were no deaths among the infants born in the vitamin families; none of these mothers took vitamins.

Births and deaths may be considered as expected events in families observed over a period of time. The vitamin and control families suffered absence of some of their members due to causes other than death. Some became institutional cases. Five persons from the vitamin families were sent to mental institutions and one was sent to a correctional institution because of delinquency. In the control families three persons were sent to mental institutions, one to prison, and one to a custodial institution. An effort was made to obtain reports at intervals concerning the health status relative to tuberculosis for all except those in penal institutions.

Entry into the armed forces meant a separation from the family unit for a period of time. Twenty-one young men from the vitamin families were admitted either to the Army or the Navy compared with twenty-four from the control families. One man in the control group entered the Merchant Marine service. There was only one medical discharge among those in both groups. After two years in the Army a member of one of the vitamin families was discharged with a diagnosis of *dementia praecox*.

In the vitamin families thirteen persons reentered observation upon discharge from the armed forces; the corresponding number in the control families was ten.

A relatively small number of persons in each group of families left observation permanently—seven in the vitamin families and ten in the control families. These were instances where

young men or women married and established homes outside of New York City.

It may be concluded that the two groups of families were generally similar at the beginning of the study with respect to environmental factors believed to be important in the production of tuberculosis. During the course of observation there were marked changes in the socio-economic environment. These changes appear to have occurred with about equal intensity in both groups. The only marked difference between the vitamin and control families was in the incidence of new cases of tuberculosis among their members; the incidence among those who took vitamins was appreciably lower than the rate in the control families but the difference does not have a probability below the 5 per cent level used generally as a limit for significance.

A sufficient number of studies have been made among both white families and Negro families in various localities to establish the attack rate among their members as an epidemiological fact. In subsequent years after familial exposure to tuberculosis in Negro families the attack rate has shown little variation. In those in Williamson County, Tennessee, there was no significant change over a period of six years. In the Philadelphia study and in the Kingston study there was no significant change during a period of fourteen years. In the Harlem families, however, there was a very significant change during a period of nine years. In the period before the beginning of the nutrition experiment the attack rate in the control families was 2.5 times the rate in the subsequent five years; in the vitamin families it was about 7 times the rate in the subsequent five years. These changes in the incidence coincided with marked changes in the socio-economic environment. The level of living of most of the families was raised. Could it be that an improved level of living affected the incidence of tuberculosis? The data from this study in Harlem certainly suggest that improvement in the level of living of tuberculous families in the very lowest economic group may act as a preventive measure.

Indeed, Frost suggested some years ago that such a measure might be effective.

Throughout the entire period of the special nutrition study, Dr. Herbert R. Edwards, at that time director of the Bureau of Tuberculosis, was medical director of the study program. Also, for the same period, Dr. Neville C. Whiteman was chief of the medical staff of the Upper Harlem Tuberculosis Clinic.

The home visiting was done by nurses of the Community Service Society. Miss Jean South, R.N., was the general supervisor of nurses until the end of 1945. After that time Miss Eleanor Cryan acted as supervisor.

At the beginning of the special experiment in nutrition, a nutrition clinic, financed by the Milbank Memorial Fund, was established. The nutrition clinic was under the direction of Dr. H. D. Kruse of the Milbank Memorial Fund. Miss Eleanor Cryan, R.N., of the Community Service Society, acted as supervisor of the clinic.

ACKNOWLEDGMENTS

An especial acknowledgment is made to the New York City Department of Hospitals and to the private hospitals and other agencies for permission to obtain for statistical purposes records of the services rendered to members of the families included in the special study. Records of medical care were obtained from the following local hospitals: Harlem, Morrisania, Willard Parker, Metropolitan, Bellevue, and Rikers Island Prison Hospital; New York Orthopedic, Woman's Hospital, Manhattan Eye, Ear, and Throat, Polyclinic, St. Luke's, St. Vincent's, Harlem Eye and Ear, Lutheran, and New York Hospital; Memorial, Roosevelt, Hospital for Joint Diseases, Sloan Hospital, and the Vanderbilt Clinic.

An especial acknowledgment is made to the families which formed the study group and whose cooperation was essential to the conduct of the study.

Acknowledgment is made also to Miss Anne Baranovsky, formerly of the Milbank Memorial Fund, for special assistance in coding and tabulating the data of the study, especially that dealing with food habits of the families.

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APPENDIX 1

Appendix Table 1. Distribution of vitamin and control families according to position of the index case in the family—upper Harlem area of New York City.

POSITION IN THE FAMILY OF THE INDEX CASE	VITAMIN (97 FAMILIES)	CONTROL (97 FAMILIES)
	Per Cent	
TOTAL	100.0	100.0
Husband	35.5	26.1
Wife	21.0	21.6
Child	32.2	32.9
Sibling of Husband or Wife	8.0	15.9
Nephew or Niece	3.3	3.5

Appendix Table 2. Distribution of families according to source of income, 1942—upper Harlem area of New York City.

SOURCE OF INCOME	VITAMIN (97 FAMILIES)	CONTROL (97 FAMILIES)
	Per Cent	
TOTAL	100.0	100.0
Earnings	35.4	38.8
Earnings and Some Public Assistance	11.5	12.2
Public Assistance	53.1	49.0

Appendix Table 3. Distribution of families according to composite ratings on food habits, 1942—upper Harlem area of New York City.

CLASSIFICATION OF FOOD HABITS	VITAMIN (97 FAMILIES)	CONTROL (97 FAMILIES)
	Per Cent	
TOTAL	100.0	100.0
Standard or Above	29.2	21.1
Slightly Below Standard	30.3	28.9
Marginal	28.1	38.9
Unsatisfactory	12.4	11.1

Appendix Table 4. Distribution of families according to crowding rating—upper Harlem area of New York City.

CROWDING RATING	PER CENT		NUMBER OF FAMILIES	
	Vitamin	Control	Vitamin	Control
TOTAL	100.0	100.0	97	97
More Than Adequate	14.4	7.2	14	7
Adequate	36.1	39.2	35	38
Unsatisfactory	33.0	35.1	32	34
Very Unsatisfactory	16.5	18.5	16	18

Appendix Table 5. Change in source of family income, 1942-1946—upper Harlem area of New York City.

SOURCE OF INCOME	PER CENT		
	1942	1944	1946
	VITAMIN		
	(97 Families)	(92 Families)	(87 Families)
TOTAL	100.0	100.0	100.0
Earnings	35.4	72.8	79.3
Earnings and Some Public Assistance	11.5	5.4	4.6
Public Assistance	53.1	21.8	16.1
	CONTROL		
	(97 Families)	(82 Families)	(82 Families)
TOTAL	100.0	100.0	100.0
Earnings	38.8	71.9	69.5
Earnings and Some Public Assistance	12.2	9.8	11.0
Public Assistance	49.0	18.3	19.5

Appendix Table 6. Change in mean annual income per cost unit, 1942-1946—upper Harlem area of New York City.

FAMILY GROUP	MEAN AVERAGE ANNUAL INCOME PER COST UNIT	STANDARD ERROR OF MEAN	STANDARD DEVIATION
	1942		
Vitamin	\$559	± 47.31	328
Control	488	± 23.43	178
	1944		
Vitamin	\$931	± 62.79	416
Control	853	± 50.70	369
	1946		
Vitamin	\$942	± 68.79	440
Control	993	± 53.99	404

Appendix Table 7. Change in rating on food habits, 1942-1947—upper Harlem area of New York City.

CLASSIFICATION OF FOOD HABITS	PER CENT		
	1942	1944	1947
	VITAMIN		
	(97 Families)	(89 Families)	(80 Families)
TOTAL	100.0	100.0	100.0
Standard or Above	29.2	71.2	50.0
Slightly Below Standard	30.3	18.8	37.2
Marginal	28.1	5.0	10.2
Unsatisfactory	12.4	5.0	2.6
	CONTROL		
	(97 Families)	(90 Families)	(79 Families)
TOTAL	100.0	100.0	100.0
Standard or Above	21.1	70.9	71.6
Slightly Below Standard	28.9	22.8	21.6
Marginal	38.9	3.8	4.1
Unsatisfactory	11.1	2.5	2.7

Appendix Table 8. Distribution of families according to number of moves of households during five years' observation, 1942-1946, 1947—upper Harlem area of New York City.

NUMBER OF FAMILY MOVES	PER CENT		NUMBER OF FAMILIES	
	Vitamin	Control	Vitamin	Control
TOTAL FAMILIES	100.0	100.0	97	97
0	39.2	38.2	38	37
1	26.8	27.8	26	27
2	22.7	19.6	22	19
3	4.1	8.2	4	8
4	4.1	3.1	4	3
5	3.1	3.1	3	3

APPENDIX 2

Description of qualitative classes used in rating weekly food records:

1. *Rating for Milk Used Per Person Per Week*

Standard or Above	4 quarts or more
Slightly Below Standard	3 quarts
Marginal	2 quarts
Unsatisfactory	1 quart or less

2. *Rating for Eggs Used Per Person Per Week*

Standard or Above	5 eggs or more
Slightly Below Standard	3 or 4 eggs
Marginal	2 eggs
Unsatisfactory	1 or no eggs
3. *Rating for Times Citrus Fruits and Tomatoes Used Per Week*

Standard or Above	6 times or more
Slightly Below Standard	4 or 5 times
Marginal	3 times
Unsatisfactory	2, 1, or no times
4. *Rating for Times Green and Yellow Vegetables Used Per Week*

Standard or Above	7 times or more
Slightly Below Standard	5 or 6 times
Marginal	3 or 4 times
Unsatisfactory	2, 1, or no times
5. *Rating for Times Lean Meat, Fish, or Fowl Used Per Week*

Standard or Above	8 times or more
Slightly Below Standard	6 or 7 times
Marginal	4 or 5 times
Unsatisfactory	3, 2, 1, or no times
6. *Composite Rating for Five Food Groups*

Standard or Above	5 ratings standard or above
Slightly Below Standard	1 or more ratings slightly below standard, no rating marginal or unsatisfactory
Marginal	1 or more ratings marginal, no rating unsatisfactory
Unsatisfactory	1 or more ratings unsatisfactory

When cheese was needed to meet the recommended allowances for milk, it was considered as a milk substitute. When the milk requirement was met with some of the cheese used, the rest of the cheese was considered as a meat substitute. All of the cheese used was considered as a meat substitute when the milk requirement was met without the use of cheese.

Procedure for using cheese as a milk substitute (based on values for calcium):

1. 1 lb. of cottage cheese = 1 pint of milk
2. 5 ounces of cheese (other than cottage cheese) = 1 quart of milk

Procedure for using cheese as a meat substitute (based on protein values):

1. 2 ounces of cheese (other than cottage cheese) = 1 serving of meat
2. 3 or 4 ounces of cottage cheese = 1 serving of meat

Procedure for using dried peas or beans as a meat substitute:
1 serving of dried peas or beans = 1 serving of meat

The dietary pattern to meet recommended allowances, outlined by the Food and Nutrition Board of the National Research Council is as follows:

Milk, adults: 1 pint daily; children 1 quart daily
Vegetables: 2 servings daily; 1 green or yellow
Fruit: 2 servings daily; 1 citrus or tomato and 1 other
Eggs: 3 or 4 times per week
Meat: 1 serving daily
Whole grain or "enriched" cereal and bread: at least half the intake
Butter or fortified oleomargarine (100-500 calories)
Potato: 1 or more servings daily

The description of the crowding rating is as follows:

1. More than adequate: More than one room for sleeping per person or per married couple plus two additional rooms (for living room and kitchen).

2. Adequate: One room for sleeping per person or for each two persons of suitable age and sex plus two additional rooms (for living room and kitchen).

3. Unsatisfactory: One room for sleeping for each two persons of suitable age and sex, plus one additional room for kitchen.

4. Very unsatisfactory: Less than one room for sleeping for each two persons of suitable age and sex, plus additional room for kitchen.

Instructions (crowding rating) given for determining suitable age and sex for sharing a sleeping room were as follows:

1. *Sex*: One sleeping room for two persons of opposite sex is considered suitable if the two persons are married or if both are under 6 years of age.

2. *Age*: (a) A separate sleeping room is to be allowed for infants under 2 years of age, except where there is more than one infant under 2.

(b) Two persons under 20 years of age who are of the same sex may share the same sleeping room if there is less than six years difference in their ages.

(c) Two adults who are 20 years of age or older and of the same sex may share the same sleeping room if there is less than fifteen years difference in their ages.

(d) An adult who is 20 to 25 years of age may share a room with a younger person of the same sex if there is less than six years difference in their ages.

3. *Lodgers:* A separate room is to be allowed for each lodger of different sex, unless a married couple. Related lodgers will be treated in the same way as family members, except that no allowance will be made for a separate living room and kitchen for lodgers.

INTERNATIONAL APPROACHES TO MODERNIZATION PROGRAMS

H. W. SINGER¹

I MIGHT preface my talk by taking up the question of the relationship between national and international programs of technical assistance, which was raised in the discussion of the preceding paper. We in the United Nations can only say that, according to our Charter, the members of the United Nations have committed themselves to take separate and joint action—that is the wording of the Charter—to promote the various purposes of the United Nations, including economic development. Therefore, any country which has a bilateral program of its own, far from competing with anything the United Nations is doing, is in fact aiding it and is behaving as a good and loyal member of the United Nations in fulfilling the words of the Charter.

I may also add that while a good many problems of coordination have inevitably come up in our work, any form of competition between our program and national programs, the American or any other, so far has not been among the difficulties that we have encountered.

It would be a commonplace to say that the United Nations is interested in a program of modernization of underdeveloped countries. It would also be a gross understatement. The promotion of economic development is at the life center of the work of the United Nations. It permeates all its activities and all the purposes that it stands for. It is the duty of the people working through the United Nations to look at economic problems from an international angle.

No one who does that can fail to be struck, not so much by the progress achieved in some parts of the world, but by the very striking fact of the enormous international disparity in various national incomes, and by the fact that that disparity

¹ Economic Development Section, Division of Economic Stability and Development, Department of Economic Affairs, United Nations.

shows no visible signs of reduction. In other words, as far as the readable signs go, the countries that already are ahead, are moving ever further ahead; the countries that have been stagnating in their national incomes, tend to go on stagnating.

That simple fact alone would be quite sufficient to explain the concern of the United Nations with the problem that we are discussing here today. I hope I am not flogging a dead horse, but if any further proof is needed, perhaps I could just quote a few sentences from the Preamble to the Charter of the United Nations which is meant to be the inspiration of the purposes of all the international organizations' work. The words used are ". . . to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind. . . ."

You can hardly deny that these extreme disparities of income which we witness today are a tremendous threat to peace. Superficially, we seem to be more worried about conflicts between nations of fairly equal standards of living, but ultimately and on the very long view there is no doubt that the present extreme disparities of standards of living create a highly explosive situation.

The Preamble goes on to talk of the ". . . dignity and worth of the human person. . . ." I need not remind you that in conditions of extreme poverty, starvation, and squalor, the dignity and the worth of the human person is very difficult to envisage. To me it becomes an empty phrase or formality unless it goes along with economic improvement.

There is mention of ". . . the equal rights of men and women and of nations large and small. . . ." The equal rights of nations also become empty formalities if one nation is immensely wealthy and backed up by the full force of modern technology, and other nations are stagnating and entirely dependent upon other countries for improvement or even sheer subsistence.

I need not go on quoting. I just wanted to emphasize the point that economic development is not a problem which concerns us merely because we are instructed by particular bodies,

by commissions, by assemblies and councils, to deal with those problems. The United Nations cannot possibly be the United Nations if it does not make that particular problem one of its main concerns.

I think you expect me to concentrate on our technical assistance program which, at the moment, at least, is the focal point of our work for the economic development of underdeveloped countries. I do not want to give the impression that we do not feel our work has been given a tremendous impetus by President Truman's inaugural speech. It has certainly been given that. However, I do want to say, very modestly, that our work started before that speech was made. As a matter of fact, it goes back to the tradition of the League of Nations.

The League of Nations had a very creditable program in China which perhaps now, in the light of the new developments in technical assistance, might call for more study than it received at the time. There were others, including a technical assistance program in Liberia with which Dr. Leland is very familiar. All I want to say is that this technical assistance tradition goes back a very long way but, of course, when we talk of a technical assistance program we really have in mind the developments of the last years.

When the previous paper was discussed, someone asked why there should be a United States program in addition to a United Nations program. To those of us at the United Nations this is a surprising and flattering question. I tried to answer the opposite question for myself: Why is there a case for a United Nations program instead of the various national programs that are being developed?

I think there are a number of answers to that. There are very special advantages in having technical assistance activities done through an international organization or a series of international organizations, including the various specialized agencies. But perhaps before I list those advantages we should consider briefly the technical assistance program in a broader context.

At the present moment everyone working on the problem is

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very much involved in technical details. There are matters of organization to be discussed, such as allocations of funds and administrative problems in the Council and the Secretariat. There are many details to be decided, persons to be recruited, papers to be prepared, places of fellowships and scholarships to be founded in the colleges and universities, and other matters which I may mention later.

I think it is worth while, however, to look at this program from the ultimate aims and not so much from the present pressure. I think you could say that in this program of technical assistance to underdeveloped countries, if it is successful and if it ultimately becomes what we hope it will become, we will have an attempt, for the first time in economic history, to change the structure of comparative advantages throughout the world, instead of building a world trading system on the existing comparative advantages.

In saying that, I am not trying to minimize the importance and advantages of building a world trading system on the existing basis. Economists never have ceased to stress these advantages. However, the underdeveloped countries have always felt—more than economists have been prepared to admit—that they are not getting a fair share of the benefits of world trade on the existing basis. I think this technical assistance approach is, from the point of view of the underdeveloped countries, an inevitable supplement to the trading approach.

The two approaches are not, as far as I can see, mutually exclusive. We can go on building up trade on what we have. It would be foolish to stop trade now on the assumption that the country producing raw materials today may become the manufacturing country of a hundred or two hundred years from now. That would be an absurdity and no one is suggesting it. At the same time that the technical assistance work is going on, however, conditions may so change that we can arrive at a different type of trading which may be more satisfactory to all concerned.

The second point in this broader analysis of the field is that

any technical assistance work, including that which the United Nations might do, may serve to release very considerable productive forces which are now kept down in the underdeveloped part of the world by the lack of certain complementary factors. There is no doubt that technical knowledge is the result of a long tradition of scientific attitudes that have grown up in the Western world specifically. The Western world has behind it forces of education, of discussion, of passing on of skills, crafts, engineering, research, and so on.

It seems to me that that is a necessary export. Lack of this particular factor of production is the thing which holds back underdeveloped countries more than any other. If it should be possible, through technical assistance, to transmit or to transplant that catalytic factor of production which is now lacking in these economies, we might be able to succeed in our planning provided we give this program a chance to work for a sufficiently long period. We may in that way be able to release productive resources which might be a very high multiple of the amounts put in.

With those two very tentative and risky propositions before us we may see more clearly the special advantages of having a program of this sort done by an international organization and by international accord.

We must realize first of all, and it is a point not disputed by anyone, that the recipients of technical assistance are very often in a suspicious frame of mind. They are on the spot. They have to ask for technical assistance but they want to be certain that the advice given and that the technical assistance given is completely impartial. In saying that, I do not want to imply that when the approach is bilateral and purely national, the advice is not generally also impartial. What I do mean is that an international organization can, first of all, avoid a certain amount of friction. It can remove certain resistances from the minds of the recipients which might otherwise handicap the effectiveness of technical assistance programs. It has been very widely stressed that the effectiveness of technical assistance de-

pend upon the enthusiasm which the receiving countries have toward it, with which they follow it up, act upon it, and operate it.

Secondly, cases are known where, in the past, with purely national assistance there has had to be a duplication of expenditures. Requesting governments have had to ask identical teams of experts from two different countries to analyze the same problems. There may be a certain amount of economy in such cases where a government feels it would not like to be led by the advice of one single other nation.

Thirdly, I should say that an international organization has a wider choice in the trained personnel. When purely bilateral assistance is given, quite naturally the range of experts available for transmission or training programs or fellowships or whatever it may be, is nationally limited. The countries which are rendering technical assistance through the United Nations, however, might each contribute the best they have and contributions will not be limited to one or two countries. We expect that many countries will be, at one and the same time, recipients and donors of technical assistance.

In this economic world of ours there is an enormous amount of specialization in industrial development among the industrialized countries. That is reflected in the amount of trade being carried on in the world today. There was a time when any country feared that, with the industrialization of another country, it could no longer trade with the newly-industrialized country. Exactly the opposite has happened. The exchange of goods among individual countries where all sides are well industrialized is now the most effective type of trade.

If we apply the lesson of that to technical assistance, it also follows that there is an enormous amount of specialization of skills, knowledge, and industrial traditions in various fields. There is no doubt that by pooling these specialized developments among the various more or less industrialized countries, by "bunching" them through an international organization, and by sending them to underdeveloped countries—not sepa-

rately but jointly—enormous advantages can be obtained. Finally, and perhaps the most important point although related to the first, the underdeveloped countries will ultimately accept the advice given by international teams or international organizations with less resentment than they would from purely national experts. My point here is that the advice to be given is often not very palatable. As I said before, the success of these schemes generally depends upon cooperation; it depends upon on-the-spot cooperation.

For instance, when one of our missions went out recently the members were much impressed by the existence of fairly modern and very competently designed irrigation works. Technically, they were very competently done and could have been of immense value in the area. They were not operating. All that was required to bring a large area of land into greatly increased productivity was the small and simple work of cleaning out accumulated debris. Nobody seemed to be interested in doing it. The water was available, the land was available, but those responsible for the enterprise were unable to capture the interest and the imagination of the local people. The government had failed somehow to organize local effort and no spontaneous efforts were forthcoming. It literally was spade work that was required; no expenditure of money or anything else was necessary.

That sort of advice is very unpalatable if given from one government to another. Perhaps if governments receive teams from the United Nations and its agencies, they might be able to take advice of that sort more easily. They might feel fear of one nation trying to give advice to another nation. The United Nations, however, is an organization with prestige but without "designs"; it can give friendly and generally unpopular advice in such matters.

Having given several arguments in favor of international assistance programs, I should now like to emphasize that the current United Nations program in this field received much support and stimulus from "Point Four" developments in the

United States. In the present "Point Four" area there was originally what is now affectionately called our "little" program involving only \$200,000. That has grown now to about \$700,000. The initial program was extremely valuable to us. It enabled us to plan intelligently and put forward the much more ambitious program that Mr. Hayes has referred to.

I think the general trend of the discussion of that expanded program in the Economic and Social Council was to say that the program could have been improved with the help of priorities but that practically all of the things listed were worth doing. In fact, we were told that many other things worth doing were not even listed. I mention that to give an indication of the enormous range and scope of programs that have now become feasible, very largely as the results of the experiences gained through contact with governments in the early programs.

The expanded cooperative program of technical assistance will require a high degree of coordination between the United Nations itself, the central organization at Lake Success, and its various specialized agencies. We are trying to solve this problem by setting up what is, in a way, a new venture in international administration. A new Secretariat will be started not from the United Nations or from any single specialized agency such as FAO, WHO, or UNESCO. It will be jointly staffed from all of them; it will belong to all of the different international organizations, not to any one of them. Requests for technical assistance will go to this body.

In setting up this inter-agency Secretariat, a step was taken to avoid having the various agencies fight for funds. The governing bodies of the United Nations through the General Assembly have laid down, for the first year of the expanded program of technical assistance, a fixed series of percentages under which any funds that can be collected will be given to the various organizations. The top amount of 29 per cent is for FAO. The next highest is 23 per cent for the United Nations Secretariat directly, which operates in the fields of industry and land transportation, and in other fields not covered by

specialized agencies. The proportion goes down to 1 per cent for the International Civil Aviation Organization.

It is rather interesting, in the light of the discussion we had before, that the governments increased the percentages that they wanted allocated to the FAO and to the United Nations Secretariat, the two agencies which deal with economic productivity of agriculture and industry.

The social agencies, education, health, and social security were somewhat adversely affected in their share. I do not think that was in judgment of the very valuable work of those organizations. Everybody agreed that education and health are basic prerequisites, but there appeared to be the belief that technical assistance on economic problems could be made to pay more quickly. The prevailing opinion appeared to be that the whole program was on trial and that it would not be allowed to expand or even to continue unless it could show rather immediate returns. Hence it was believed expedient to favor projects which were deemed most likely to show results in two or three years time and which could then be put forth as substantial reason for continuing the program on its own merits. The assumption that more immediate results might be expected in economic than in health fields is at variance with some of the statements that have been made at this round table. Nevertheless it was largely on the strength of that argument that the funds for economic agencies were increased and those for social agencies reduced.

In the discussion of Mr. Hayes' paper a question was raised concerning coordination within the underdeveloped countries themselves. Should their various governmental departments operate independently in making requests for technical assistance? For instance, should the Chilean Ministry of Agriculture approach the Food and Agriculture Organization or should a centralized body in Chile approach the United Nations directly? It is interesting to note that in general the representatives of the more developed countries were the ones favoring the more centralized approach. It may be that the under-

developed countries wanted to keep the scheme as decentralized as possible since they themselves did not have sufficient centralization to make a joint general approach.

As indicated previously, we have a central technical assistance board and fixed general allocations of percentages. We respect the principle that the government is free to ask for assistance. The request has to go to this technical assistance board, which is a joint organization. The government is entitled to ask for technical assistance, specifying the field and agency in which they want technical assistance.

There is no possibility now for governments to put forward a request for technical assistance on economic development in general. It has to be a more detailed approach in a particular way. Governments, of course, are entitled to ask for general economic missions if they want to be advised on what sort of technical assistance to ask for. They are entitled, under the program, to come in and ask to be told what particular type of assistance they need. If they themselves feel they know what they want and ask for it specifically, then under our rules and statutes we are to give them that particular type of technical assistance.

In the foregoing discussion I have talked mainly in terms of future developments because the program has just started. There are now, however, groups of United Nations experts working in a number of underdeveloped countries, ranging from Ecuador to Burma. We have received formal requests for assistance from the governments of Guatemala, Mexico, Iran, Bolivia, Chile, Pakistan, Afganistan, and others. Informal approaches have been made by a great many other countries.

We already have some sixty technicians, including medical experts, from underdeveloped countries who have been given fellowships in more advanced countries to secure training or do research in private industries, laboratories, universities, and hospitals. The persons receiving fellowships have been very enthusiastic about the help which has been given to them in the industrialized countries. They have returned to their own

countries and their governments are using their newly-gained knowledge and skills. There is also a corresponding United Nations program of providing training inside the underdeveloped countries.

In general, this program has helped us in the United Nations to appreciate the magnitude of the problem, and the difficulties which lie before us. Some of our group are themselves nationals of underdeveloped countries. In a seminar which we recently organized on problems of financing economic development, we saw time and time again one or another of the group get up and say, "In our country we have come up against this particular problem. We do not quite know how to tackle it." Another member might say, "We have been up against that identical problem." Then they, in turn, discuss that problem and its possibilities with the officials of their own countries, their own colleagues, and try to follow through. So we feel that from this very small beginning the circle of analyses and study will spread in the underdeveloped countries.

Technical Assistance in Relation to Finance. One of the major problems in the underdeveloped countries other than technical assistance is that of finance. If we look at economic development in a broad way, however, the two problems are not separate, for external investment and technical assistance frequently go together.

It has been said before that the capital of industrialized countries is like an iceberg. Only one-tenth is above the water; nine-tenths is invisible. The normal, tangible accumulation of factories, machinery, houses, wealth, is very impressive, but nine-tenths of the total capital of a country is intangible capital. It is the accumulation of knowledge, of scientific tradition, of skill, which is submerged and which is not, at any given point of time, visible. Similarly, the results of technical assistance are submerged in underdeveloped countries; the investment is the visible one-tenth.

There are two views on the subject of the relationship of technical assistance and finance. One was the philosophy held at

Geneva when our expanded program was approved. This was the view, and I take it that this is also the feeling of the United States Department of State, that technical assistance can do a lot of good without finance.

The other point of view is that technical assistance serves to prepare projects and to ready them for financing. In the experience of the International Bank, one of the great obstacles is the lack of projects that are ready or sufficiently mature for financing. If technical assistance can help in preparing such projects that would be all to the good. Our own hope is that international approval and supervision of certain types of projects may help to stimulate the flow of private capital into underdeveloped areas.

There is also the more cynical view that technical assistance is merely the pretext under which the industrialized countries avoid having to spend larger sums. The contrast between the 45 million dollars for technical assistance in the United States bill and the billions of dollars for help to Europe has been mentioned in that respect. As I said before, the real hope of technical assistance is that for each dollar spent on technical assistance there will be released tens, hundreds, or possibly thousands of dollars in terms of increased domestic output in those countries, and also in the flow of external investments. If it is going to prove itself, the final results of the technical assistance program should be something equivalent to those of the Marshall Plan. It is the result which should be compared and not the amounts of money being spent.

Trade. Trade is a more important matter to underdeveloped countries than is commonly realized. It is by way of the export proceeds that use can be made of the domestic resources and that capital may be secured from abroad to modernize. There is the related problem of prices. The underdeveloped countries must be able to sell their exports at prices which are not disastrously low in terms of the prices of the things they have to buy.

One solution might be the materialization of the proposed

International Trade Organization. That organization would establish a very important principle of international agreement, namely, that commercial policy should be a function of economic development, and that countries which are presently at a low stage of economic development should be granted certain special privileges in international trade.

Migration. Finally, I should say that population is one of the crucial problems for international organizations to think about. Capital transfer from industrialized to underdeveloped areas often have previously taken the form of transfers of people with their enormous intangible capital of skills. If one considers the parts of the world into which industrialization spread during the nineteenth century—the United States, Australia, and Canada—one could almost say that during that period industrialization was spread by immigration rather than by investment.

Certainly it was not done by investment of capital alone but by the additional investment of people. This would seem to suggest that voluntary immigration and the direction of such a flow into underpopulated and underdeveloped countries supported by capital movements would be of great benefit to such countries. This is a problem which might in the future require an international approach.

FOREIGN CAPITAL IN ECONOMIC DEVELOPMENT: A CASE-STUDY OF JAPAN

EDWIN P. REUBENS¹

THE role of foreign capital in economic development is much discussed nowadays but remarkably little analyzed. The President's "Point Four" proposal in January, 1949, galvanized old hopes and new ambitions; it has attracted widespread endorsement, but also has provoked a variety of denunciations. Even among those who give general endorsement, there is an evident lack of agreement on how to implement the policy. There is at one extreme a demand that the United States simply donate the necessary capital, goods and services, as a clear gift; at another extreme is an insistence that private investors will do the job, if only all the risks of risk-taking are guaranteed away!

Foreign capital is sometimes presented as the "hero of modernization," sometimes as the "villain of the piece," and sometimes simply as the "prop-man." Even a role of the "victim" has been alleged by some parties in the advanced countries, citing the difficulties and disappointments of past foreign investing, as well as the stringent regulations often imposed nowadays.

Obviously interpretations of history vary. But it should be evident that the conditions of foreign investing have changed in many ways from the pattern that was common in the nineteenth century.² Some of the current controversies may be traced to a kind of psychic lag, in the form of concepts and doctrines no longer appropriate to conditions today.

There is perhaps little question of the potential technical

¹ Department of Economics, Cornell University.

² Where foreign development formerly "complemented" the advanced economies, nowadays it tends to be more and more "competitive." Furthermore, available funds and exportable real resources are heavily concentrated in the United States, where the values of caution and security are perhaps preponderant today. In addition, the expanded role of government, both in this country and abroad, has apparently tended—for the time being, at any rate—to constrict the channels of foreign lending, and to divert to governmental channels the demands for funds and assurances against risk.

contribution of foreign capital, as regards the productivity increases that come with modern equipment and successful organization. This is the technologic, or engineering, side. The difficulties and problems, however, lie in the broader economic and social aspects. It is my hope to shed a little light in this field by exploring the role of foreign capital in some actual historical cases, principally in the development of Japan, with some contrasting perspectives on China and India. In this way, the relevance of the historical experience to present problems may perhaps be made explicit.

The Japanese case is particularly interesting to us for several reasons. In the first place, Japan is an exemplar of the rather special and generally unfavorable conditions which prevail in many of the countries now seeking economic development. These conditions, which define what may be called an "economy of Oriental type," include : (a) an already dense population, which tends to multiply dangerously during the modernization process; (b) scarcity of resources and/or low productivity per capita; (c) a relatively late start in the world-wide sequence of industrialization; (d) an ancient culture, whose deeply-rooted values and mores offer serious opposition to efforts at modernization. Such an economy in India, China, Indonesia may be contrasted with the case of the new countries, population-empty and resource-rich, such as Canada and Australia in recent decades, and the United States in the past, and today perhaps Africa, Brazil, and others. The development process in such new countries differed considerably from efforts at modernization in countries of Oriental type. Theories and experience cannot be transferred in any facile way from the former to the "Oriental" case.

Despite the difficult "Oriental" conditions that faced Japan, she succeeded in carrying out a continuous, cumulative development. This process was only in part a planned, Government-sponsored effort; Japan did not rely upon foreign capital to take all the steps and foot all the bills; and it escaped foreign imperialist domination.

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Certain features of the Japanese case were of course peculiar to that country, but many others are adaptable to the countries now seeking development. The advantages and dangers of such adaptation are part of my theme.

I. FOREIGN CAPITAL IN JAPAN

It is widely assumed that the initial stimulus to development must come from foreign capital, which is frequently expected also to support the early stages of progress—until domestic capital resources can begin to take over.³ The poorer the resources of a country, the heavier the population pressure, the stronger the cultural resistance, and the faster the desired tempo of progress, the greater is said to be the need for external aid. But the fact is that Japan did not use a great deal of outside funds in her modernization. This is in marked contrast to such cases of successful development as Canada, Australia, and the United States, and also contrasts with such Oriental countries as India and China where advancement has been very limited.⁴ The outstanding parallel to the Japanese case is found in the USSR, which obtained very little foreign capital assistance.⁵

A. In the early period of her modern career, from the Meiji

³ Several lines of need for foreign capital during economic development may be distinguished. One of these is relief of pressure on the balance of payments, arising in the absence (or insufficiency) of a foreign exchange surplus from ordinary trade, and in the presence of importation of capital goods for expansion of productive facilities plus importation of consumer goods to meet demands newly generated by the developmental process itself; an additional pressure may arise from the service of earlier foreign obligations. Quite another line of need for foreign capital is the stimulation of enterprise even when native capital accumulations exist, if these are in the hands of persons reluctant to change old ways and take new risks. Still another demand for foreign funds may arise from the fiscal difficulties of governments operating under imperfectly integrated financial systems.

In any actual situation, these needs will be variously inter-related, so that a particular action, such as foreign borrowing by government, may serve them all.

⁴ Foreign capital invested in Canada by 1900 exceeded that in Japan in 1913; and the Canadian figure for 1913 was three times that of Japan in 1929. While Canada's area vastly exceeded Japan's, her population was relatively trivial. Viner, Jacob: *CANADA'S BALANCE OF INTERNATIONAL INDEBTEDNESS, 1900-1913*. Cambridge, Harvard University Press, 1924, p. 299.

China, in comparison with Japan, shows two and one-half times as much foreigner's investments as of 1929. Remer, C. F.: *FOREIGN INVESTMENTS IN CHINA*. New York, The Macmillan Company, 1933, pp. 58-60.

⁵ Baykov, Alexander: *THE DEVELOPMENT OF THE SOVIET ECONOMIC SYSTEM*. New York, The Macmillan Company, 1948, p. 87, p. 154.

Restoration of 1868 to the close of the Sino-Japanese War in 1895, Japan floated abroad only two moderate-sized long-term loans. These loans were issued at the very outset of this period of nearly thirty years, and totaled only 3.4 million £ sterling. In addition, during this same period Japan received considerable short-term credits and a small amount of direct investments (largely the working capital of commercial firms). The short-term credits and the long-term loans were soon repaid, so that by 1896 Japan had virtually no foreign capital obligations.

During what may be called the middle period of her development, from 1896 to 1914, Japan made much greater use of foreign capital. Bonds were sold abroad in nearly every year, chiefly National Government issues, supplemented with a small but growing amount of municipal and corporation issues. In addition there was a relatively minor inflow of direct investments by foreigners. The total amount of foreign capital entering Japan during this period was small relative to the whole increase in the national wealth, but equalled a major share of the increment in real productive facilities; and, from the viewpoint of the international balance of payments, the capital inflow permitted a 17 per cent average excess in imports of goods and services over the total exports.

The third period of this record covers the years of the First World War, when Japan obtained virtually no new inflows of capital. Indeed she carried out a substantial reduction in her foreign obligations and built up very large foreign credits through the huge export surpluses in her trade with the Allies and with her Asiatic neighbors. (The substantial parallel to India's role during the recent war is noteworthy.)

During the Twenties, Japan's chronic excess of imports reasserted itself. This was met by virtual draining of the war-time-accumulated foreign credits, plus a resumption of new foreign borrowing. The new capital inflow was marked by the appearance, for the first time, of a preponderance of business investments over Government loans, but the total inflow was

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still small relative to the volume of domestic investments, and was partly offset by the sizable outflow of Japanese investments into Asia and elsewhere.

During the Thirties, it may be noted, the foreign flotation of Japanese long-term loans entirely ceased, while the amount of foreigners' direct investments in that country was quite limited.

B. Taken as a whole, this is a remarkable, even a startling, record. Japan was a poor country which achieved economic development without relying on foreign capital to, so to speak, "donate" the bulk of her real capital formation. How did she do it? What were the gains and losses in not obtaining larger amounts of foreign assistance?

It should be clear that the tempo of development in Japan was not slow. The rise of national income per capita was faster than was the case for almost any other country during an equally long time-span.⁶

Nor is it true that Japan chose to forego all "non-productive" expenditures, particularly armaments.

Her ability to dispense with vast sums of foreign capital can hardly be explained by her endowment in natural resources, which was poor indeed.⁷

Nor did Japan possess at the outset of her modernization much of those fabled hoards of gold and jewels sometimes ascribed to Oriental countries. A modest "commercial revolution" had taken place within secluded Japan during late Tokugawa.

⁶ Cf. Clark, Colin: *THE CONDITIONS OF ECONOMIC PROGRESS*. London, Macmillan, 1940, chart facing page 147, which indicates that the rate of advance in Japan was surpassed elsewhere only during very short periods and under extraordinary conditions (e.g., the USSR during the 1920's). The national income estimates for Japan are confirmed by the figures on the growth of her productive facilities and the output of her various industries.

⁷ Silk, coal, and a few other exportable commodities played a relatively important role in the early stages of Japan's modernization, but later were overshadowed by exports of fabricated goods. The totality of Japan's natural resources left her far worse off than most advanced countries and even many backward lands.

Japan was more fortunate in enjoying a temperate climate plentiful water-power, easy access to the sea, and the linguistic, ethnic, and cultural homogeneity of her population. But these are primarily "raw materials" for economic development: they are not exportable as such, and require "processing" before they can make a contribution.

gawa days, and this provided a nucleus for a few of the family fortunes of the later "Zaibatsu."

Some significance for our purpose may be imputed to certain "favorable historical accidents" in Japan's evolution. Especially notable is the timing of the First World War (which benefitted Japan so greatly, as already indicated). A similar factor is the general timing of Japan's industrialization, in an era when the adjacent Asiatic lands had not yet developed their own industries, while a long series of "innovations," both technologic and commercial, was available to Japan from the West. On the other hand, Japan's ability to profit from the World War I opportunities must be attributed to the development she had already achieved. Furthermore, there were offsetting *unfortunate* accidents, particularly the disastrous earthquake of 1923.⁸

Japan's small reliance on foreign capital might perhaps be traced to an inability to attract larger sums. Of course, this is impossible to prove or disprove. However, it seems unlikely in the Japanese case, in view of the large international flows of capital that went on throughout the world during those years, the excellent Japanese record of no defaults on interest or principal, the ease with which actual flotations were taken up and the entirely normal interest rates and bankers' commissions that were charged.

There does appear to have been a certain reluctance among the Japanese to borrow more heavily abroad. Contemporary statements at various times in her development reveal a fear of extensive foreign indebtedness—sometimes a fear of political or economic subordination (admonished by the example of China), sometimes a dread of inability to service a heavier debt.

This leads us to inquire whether the Japanese had no real need of additional amounts of foreign capital. From the viewpoint of the deficit in the balance of international payments, the need appears to have been serious indeed. With the exception of brief periods, the Japanese economy was constantly pressed

⁸ Necessitating a vast reconstruction program to which must be ascribed much of the foreign borrowing of the 1920's.

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to find foreign exchange to maintain necessary imports and to meet the service on existing foreign obligations.⁹ On the other hand, we must reckon the "capacity to absorb" additional foreign capital. The process of economic development does not appear to be "free," in the sense that simply unlimited sums can successfully be put to work. Limitations appear in the form of technical sequence (for example, goods cannot be exported until transportation has been provided); development also requires institutional and psychological transformation of the old order, involving much time and experience; and still another limitation is the threat of inflation when a given amount of foreign capital investment induces a great deal of domestic investment in producer goods (instead of consumer goods). Foreigners' investments must thus be geared to the internal process of development, and must be geared especially to domestic savings and investment, as I shall try to show in a moment.

The basic reasons why Japan was able to develop with so little foreign capital assistance, appear to be: first, that she made careful and effective use of such foreign capital as was obtained; and second, that she made careful, effective and *exhaustive* use of domestic capital potentialities. The entire process of development depended upon these two measures, and its success promoted and sustained these measures. In countries where these steps are not taken, the developmental effort, including the so-called "stimulus" of foreign capital injection, tends to dwindle away to nothing. The case of China, contrasting with the record of Japan, illustrates this principle in painful detail.

C. We come therefore to the measures of the effective use of foreign capital in economic development. The most important of these measures relate to the balance of international payments, the importation of capital goods, and the character of the foreign capital inflow.

⁹ This pressure is attested by the ominous drain of specie holdings, from 1905 to 1913, and from 1920 to 1929.

As regards the international accounts, long-term foreign capital may be expected to close a trade gap which is due to the strains of a long-run development effort. The success of that effort will provide service of the transferred capital, and is indeed the best guarantee of safety for the investment; conversely, if long-term capital is used for current consumption without development of production, service of the obligation becomes progressively more difficult, default is very likely, and further investment inflow will cease.

It appears that the Japanese trade deficits did not result from an indulgent policy on consumer goods imports (such as we have seen recently dissipating the wartime credit accumulations of several South American countries). Indeed, the Japanese restrictions on improvement in mass welfare were very severe—so much so as commonly to be labeled “exploitation.” Nowadays, however, we dignify much the same procedure with the title of “austerity,” in the planning for rehabilitation of post-war Britain as well as occupied Japan.¹⁰ It appears, in fact, that Japan’s persistent international deficits resulted from the requirements of industrialization itself, whose reach must always exceed its grasp—at least until considerable economic maturity is attained.

Among the factors contributing to the import pressure, the element of capital goods imports deserves closer attention. Imports of such goods (comprising both equipment and construction materials imports) ran between 12 and 16 per cent of the total imports; but the real relative magnitude of capital goods imports bulked still larger, when measured against “retained imports”—since the total importation was so greatly inflated by raw materials for fabrication and subsequent export.

The character and timing of Japan’s capital goods importation reveal how skillful management can reduce the burden and enlarge the net contribution. It would take us too far afield to specify this in full detail, but it may be stated briefly that

¹⁰ Some qualifications of this analogy must be entered, as regards the differences between a short-run and a long-run program, and as regards the care for the incidence of the “austerity.”

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the burden of capital goods imports was minimized in Japan: (a) by avoiding heavy capital-intensiveness where possible, through technologic substitution in some industries¹¹ and through simply avoiding or deferring other industries;¹² (b) by emphasizing industries of relatively short "maturation"¹³ and further hastening maturation by Government pioneering; (c) by stressing export-industries. On the other hand, the Japanese accepted dependence upon imported capital goods; they did not attempt (as proposed in the Bombay Plan for India, for example) to eliminate all reliance upon foreign equipment in the earliest stages of development through the creation of a costly, possibly inefficient, and probably premature domestic capital goods industry. Furthermore, the Japanese accepted the necessities of developmental sequence, notably the need to undertake transport expansion quite early, despite the heavy capital-costs and slow progress of railroads, shipping, and harbor-improvement.

The foregoing discussion of industrial emphasis has ignored so far the channeling of the foreign capital and the different effects which correspond to the various channels. The fact is that the Japanese sought their foreign capital in the main, (at least until the 1920's), through the intermediary of the Government, and in the form of bonds sold to foreign private investors. This pattern contrasts with the entrepreneurial investments which have predominated in China and Southeast Asia.

Even the Japanese private business flotations abroad were mostly associated with Government, and these too were predominantly loan rather than equity investments. Direct investments in Japan were not particularly discouraged, by any specific obstacles such as are imposed nowadays by the corporation laws and foreign-exchange regulations of many countries (requiring participation of native capital and personnel, or

¹¹ E.g., the use of electric power from small hydroelectric installations, in place of individual steam-power plants which must be large for technical efficiency and are subject to chronic excess capacity. A related example is the adaptation of small-scale industry to modern processes through the putting-out system.

¹² E.g., modern residential construction.

¹³ Notably the textile industry.

restricting transfer of profits and principal). Nor can the Japanese Government's subsidization policy be blamed for the lack of foreign entrepreneurial investment in a number of fields. During the 1920's both private rentier and private entrepreneurial investments in Japan, responding to the greater foreign knowledge of Japan and confidence in her future, did increase markedly, to the point of exceeding the Government's new borrowings. Up until that era, foreign entrepreneurs simply showed little interest in the kinds of opportunities available in Japan.

As a result of this pattern, at least in the earlier years, the Government was free to utilize the available foreign capital in accordance with the dominant Japanese ideas on national development. These called for concentration on industrialization, on food production, and on sources of invisible income. It is true that political considerations also dictated some investment in fields which were slow to yield returns, if not actually "un-economic"; some examples—which are not beyond debate—are the iron-and-steel industry, the State arsenals, and the sugar-growing industry of Formosa. But this was perhaps a small economic price to pay for the freedom to devote the bulk of the foreign capital to uses of the highest marginal productivity—judged not merely for specific enterprises at a given time but also in terms of the economy as a whole over the long pull. In particular, there was great success with the technique of Government industrial pioneering, including the importation of equipment and technicians for constructing pilot plants which afterward were turned over to private interests at very attractive terms. This technique served not only to circumvent the reluctances or actual resistance of older vested interests, but also spread the risk of failure over the entire State, attracted the more venturesome elements in the public, and showed the way to other private interests who in many cases could then enter the new field on their own. In effect, these Government measures not only allocated resources directly, but also promoted the mobility necessary for transforming the private allocation of resources.

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Government borrowing also served other purposes of a more familiar kind. It permitted borrowing at a time when foreign capital was very dubious about direct investments in Japan. It provided for the concentration of loans at times of greatest need, which are not necessarily the times of the greatest interest by private foreign investors—indeed the reverse is often true. It facilitated expansion in important fields like health, education, and subsistence agriculture, where private profit is either not feasible at all, or is not large enough to attract direct foreign investments. While governmental borrowing incurred a fixed burden of interest and amortization charges, it avoided the high rate of return exacted by some foreigners in their direct investments in China, India, the Netherlands Indies, and the like.

All this is not to deny the great worth of private entrepreneurial investments in certain lines. Such investments bring with them the close and sustained interest, ability, and supplementary resources of the foreign management. This factor is of greatest importance to the under-developed countries for enterprises which are intricate and subtle in either the technical or the commercial sense.

However, in those parts of the Far East where entrepreneurial investments have predominated over portfolio investments, the record to date is not encouraging in general, and is particularly discouraging as regards its influence upon domestic savings and investment. China provides virtually a classic case. Total foreign investments in that country were three times as great in dollar amount as in Japan (although only half as great on a per capita basis), and were chiefly business investments. Yet economic development in China lagged badly. Part of the explanation must be found in the character of those business investments. They were largely, although not wholly, in the fields of international banking and commerce, fields which contributed little to the improvement of productive capacity.¹⁴ The remittance of profits on the average exceeded the inflow of new

¹⁴ Indeed the destructive effect on traditional handicrafts was ruinous in many areas.

capital.¹⁵ Modernization was concentrated in the coastal cities; few benefits reached the hinterland, while dislocative effects were transmitted powerfully. More broadly still, the foreigners had little interest in promoting native savings and investment, or any competing native enterprises. On the other side of the ledger, we must enter such benefits to China as the examples of modern enterprise, the training of a class of Chinese businessmen (through the comprador system), and the establishment of islands of peace and security for business property in the concession cities.

This comparison of the Japanese and Chinese records suggests that when the native government is feeble or inert, foreign entrepreneurial investment may be the preferable means, indeed the chief hope, of modernization. But this kind of investment will lead to a general economic development only if many other factors are favorably disposed. Conversely, if the native government is dynamic, it may seek a freer hand through resort to Government borrowing abroad. If this can be done successfully, foreigners' direct investments may be welcomed only on stipulated conditions or in limited fields. In this perspective, problems such as fixed interest charges or the rate of profit remittances appear to be subordinate to the paramount issue of resource allocation for economic development.

II. DOMESTIC CAPITAL FORMATION IN JAPAN

We come finally to the question of the total dependence upon foreign funds, and how this was minimized in the Japanese case, by substantial domestic capital formation.

The possibility of increased national savings arises from increases in the national product. This is only to say that a successful industrialization, once initiated, is potentially *capable* of rising by its own bootstraps. In Japan, the increments in national product were not wholly consumed. In the terminology of economics, "the marginal propensity to consume" was held down, so that the rate of national savings was substantial.

¹⁵ Remer, *op. cit.*, pp. 170-171.

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The institutions which fostered this process provide some useful suggestions and also some strong warnings for the future.

Not all the national saving was compulsory. Voluntary saving was promoted by the peace and security which prevailed within Japan, by indoctrination in the virtues of thrift, by provision of attractive facilities for small as well as for large savers, by the high rate of return offered in deposit institutions and the even higher returns extended to stockholders, by the inheritance system of primogeniture which prevented dissipating large fortunes, and in general by the encouraging influence of the very economic expansion itself. The "Protestant ethic" which Max Weber pointed out in the West, may here be observed in Shintoist Japan.

The procedures of forced saving were somewhat more devious. A foremost factor is the low wages associated with the massive increase in population which took place in Japan during her modernization.

The marked concentration of income was a related factor promoting the propensity to save, especially because the upper-income classes deliberately limited their personal expenditures, in order to re-invest in their business enterprises. Concerning the origins of this practice, a Japanese chronicle relates that:

. . . the principals of the six Mitsui families were made to serve as clerks in their childhood in order to learn the trade. To these six families were allowed certain fixed sums of money every year to meet the expenditure on clothing, food, and daily necessities, and they were strictly forbidden to waste money in excess of these sums. Such being the case, even the seniors of the six families were not in a position to have all things their own way. If any of them refused to observe the family regulations, he was immediately forced into retirement and his name was struck off the list of the families.¹⁶

Another device of forced saving was the system of discriminatory taxation. Broadly speaking, the heaviest tax burden

¹⁶ "The Origin of the Mitsui Family" in the *YEDO KAISHI*, Vol. I, No. 5; cited by Honjo, E.: *The New Economic Policy in the Closing Days of the Tokugawa Shogunate. Kyoto University Economic Review*, IV: No. 2, December, 1929, p. 62.

was placed upon the agricultural community (from which little direct achievement in real capital formation could be expected); conversely, taxes were quite light upon the industrial sectors which are expected to do their own capital formation through the reinvestment of profits.

Still another form of forced saving was the promotion of exports, which were facilitated, as already suggested, by the indirect effects of population pressure and low wages, and were deliberately aided by industry associations, by semi-Governmental banks, by Government direction and, in quite small degree, by Government subsidization. The Government also protected certain industries from foreign competition, the principal device being the system of tariff rates which were low or zero on raw material imports, moderately high on goods competing with Japanese products and very high on luxury goods even when not directly competitive. Similarly, the Government's ruthless policy of suppressing any substantial unionization movement had the incidental effect of restricting pressure for higher wages and restraining any larger domestic consumption of the national product. This in fact is only one aspect of the general Japanese policy of dictation from above, resisting any democratization steps which might have retarded the industrialization.

Parallel to this whole system of saving is the channeling of the national savings into productive investment. Indeed many of the factors which promoted saving in the first place also served to direct those sums into real capital formation. For example, the taxation structure not only restrained the consumption of the masses, but encouraged the wealthier groups to place their savings in industrial enterprise, and also provided the Government with the funds to initiate and assist productive enterprise. In addition, a number of specific investment institutions might be noted. The savings deposit institutions, which in our own country are seriously deterred from making equity investment, were in Japan closely tied into the industrial system (through Government regulation and through links to the

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Zaibatsu), so that funds flowed almost inevitably into industrial expansion. Similarly, the corporations were tightly held by insider control, which generally followed a policy of moderate dividends and substantial reinvestment of profits. Where these institutional channels did not suffice, the Government stepped in directly with various forms of "forced investment," of which the *goyokin* (Government loans levied on rich merchants in the initial Restoration days) are a famous early form.

Underlying these specific arrangements was the vigorous growth of an "investment psychology," contrasting with the "trading psychology" which dominated the pre-modern period and which still dominates the economy of China as well as many other retarded regions of the world.

III. SUMMARY AND CONCLUSION

In conclusion, I should like to stress certain implications of the Japanese experience with regard to the dependence of economic development upon foreign capital. These generalizations rest upon the relevance of the Japanese case to other cases of development, and in particular its relevance to other economies of "Oriental type." Quantitative deductions are not precluded,¹⁷ but the most striking implications are of the qualitative and institutional type.

Our first step is to summarize how the Japanese met the major "controlling factors"¹⁸ which govern the developmental process. A close study of these factors in any specific case, and their movements as modernization advances, may give the key

¹⁷ In order to demonstrate the actual quantitative relations in the Japanese case, and to apply them to other similar cases, it would be necessary to provide far more detailed data than is permitted by the space at my disposal here.

¹⁸ A partial list of these factors includes: the desired tempo and type of development; the local pattern of resources; the requirements of sequences and complexes; the availability of and the dependence upon imported capital goods and techniques; the adjustments of optimal productive scale to the size of potential markets; the induced (indirectly-generated) pressure for consumption imports; the inflationary stimulus and threat; the availability of offsets to both international deficits and domestic inflation; the inertia of existing allocations of resources and the resistance of both vested interests and cultural conservatism; the institutional dispositions regarding the role of private enterprise, foreign enterprise, political democracy, and demands for improvement in the standard of living; the actual momentum of progress; and, last but not least, the interests and preferences of foreign investors.

to a crucial problem in developmental efforts: namely, how to measure the course, prospects, and wisdom of an on-going process. Such criteria should come from an articulated theory of development, and indeed of secular dynamics in general. Lacking such a theory as yet, it may prove fruitful to carry the factor-analysis suggested here into a wide variety of comparative cases, historical and contemporary. The present paper constitutes only a preliminary step in that direction.

In Japan, a rapid tempo of development was sought by virtually all Japanese groups holding power of decision—with the single major exception of certain agrarian interests. The desired type of development was Westernization of the economy—except in consumption patterns; and this meant, more narrowly, industrialization and commercialization together with self-sufficiency in food production within the Empire. Economic autarchy was recognized as impractical for a country in process of development, quite aside from the limitations of natural resources in the Japanese case. Appropriate markets, especially in nearby Asia, were explored and seized by commercial as well as military means. Dependence upon imported capital goods was accepted, but was minimized by prudent decisions. Consumption demands, generated by the developmental process itself, and portending either increased imports or domestic inflation, were severely repressed by voluntary and forced saving, including a vigorous exportation policy and a moderate degree of domestic inflation. On the other hand, some improvement in consumption did occur, to a modest degree consistent with needed incentives and the successful expansion of national output. The inertia or actual resistance of the *ancien regime* was overcome by Government pioneering, by cooperation between Government and private business, and by foreign capital (in the form of loans rather than direct investments). Dependence upon foreign capital was considered undesirable in principle, but in practice there was a moderate amount of outside borrowing—implemented by foreign equipment and techniques, the services of foreign technicians, and many Western methods of

business organization. Westernization did not extend, however, to the norms of political democracy, labor organization, the worth of the individual and the maximum immediate improvement of his material welfare.

These are some of the decisions which the Japanese made, explicitly or implicitly, regarding the problems that face *any* under-developed country, especially under Oriental conditions. Many of these decisions are decidedly unpalatable; and indeed some of them may be avoided in part, if not altogether, by a larger measure of foreign assistance. But foreign assistance too has its limitations and its dangers.¹⁰ In the present outlook, the "Point Four" program holds out great hopes for the long run, both for enlarging the scope of foreign assistance and for minimizing its drawbacks. But it would be folly to expect elimination of the basic constraints of scarcity and immobility, or the limitations involved in necessary priorities, internal social transformation, and re-integration into the world economy. These constraints and limitations confront not only the under-devel-

¹⁰ Space permits the reformulation of only a few of the general issues to which the Japanese experience is relevant: (1) Consider the problem of basic activities like primary education or road-building, whose expansion is essential to the success of a general development program, but whose prospects for private profit are meager if not indeed zero. A program relying exclusively upon private investment of the "individual-project" type, whether internal or international, would probably be a disappointment not only to the under-developed country but even to investors in some projects that seemed to promise high direct profits. (2) A fear of imposing fixed service charges may lead to rejection of international borrowing in favor of direct investment; but there is no clear evidence that the burden of high profit remittances is any lighter than the burden of loan service, nor that profit remittances are in fact correlated with easiness in the foreign-exchange account. (3) Still another example may be taken from the dilemma of consumption-versus-inflation: the assisting country risks involvement in a difficult choice between providing a prolonged flow of consumption goods, on the one hand, or on the other, insisting on austerity despite the clamor for improvements in welfare. (4) A final illustration may be taken from the controversy over government guarantees for foreign investments: it is quite possible that there will be no great stimulus to private overseas investing in many areas, unless the guarantees virtually underwrite all risks and assure substantial profits. Where it is necessary to supplement direct private investment—as to volume, continuity, or fields of investment—a possible solution may be drawn from the Japanese example: much of the foreign borrowing being done by and through governments, while the lending may be sought largely from private sources.

Some of these dilemmas have already appeared in the administration of the Marshall Plan for Europe. They appear in still more acute form in the current discussion of "Point Four." They are not insoluble, but they must be faced. If the form of solution must be a compromise of means and ends, valuable suggestions may be found in the relevant historical experience.

oped countries but also the advanced countries which are expected to give cooperation and assistance. There is much to be learned—to adapt and to avoid—in the Japanese methods of development and, in particular, the Japanese deployment of foreign capital.

FUTURE ADJUSTMENTS OF POPULATION TO RESOURCES IN JAPAN

WARREN S. THOMPSON¹

IN order to say anything worth while on this topic it will be necessary to make some brief and, therefore, rather dogmatic statements regarding the population and resources of Japan today and to guess at future developments in certain fields, which guesses must be expressed rather positively because of time limits, although I by no means feel as certain of their correctness as these statements may indicate.

In the first place, in the ensuing decade the population of Japan will probably increase by at least 10 million, provided the following conditions are fulfilled: (1) that in some way the essentials of existence will continue to be supplied to the people of Japan in approximately the present per capita amounts; (2) that the public health services will continue to operate about as efficiently as at present; and (3) that the decline in the birth rate during the next ten years will not be more than about 40 per cent. If the decline should be less, as it well may be, while the two preceding conditions are met, the population growth will be greater than indicated above.

In the second place, the food supply of Japan, which is already short of self-sufficiency by 15-20 per cent, is not likely to increase any faster than, if as fast as, the population, unless there is a large increase in the proportion of Irish and sweet potatoes in the Japanese diet. From the standpoint of the Japanese, this would constitute a decline in the level of living, although it need not constitute an added health hazard. It should be noted, however, that the variations in the production of root crops per acre due to variations in the weather and to the injuries inflicted on them by diseases and pests, are likely to be greater than the variations in the annual yields of the staple grain crops. This is especially likely where these root crops are not irrigated and the farmers are not experienced in

¹ Director, Scripps Foundation for Research in Population Problems.

caring for them as is quite commonly the case in Japan. Besides, any considerable increase in the acreage of root crops will take place chiefly at the expense of the staple grains since Japan has very little good land not now in crops which can be converted to such use with the reasonable expectation of obtaining large yields.

In the third place, Japan's domestic mineral resources are wholly inadequate to support more than a very modest and high cost industrial development. She has been and will remain highly dependent on imports of most important minerals. The same is true of industrial crops except silk, and wood for paper. Only coal, sulphur, and zinc, among important minerals are present in reasonably adequate amounts. Even salt, both for human consumption and for industry, must be imported or produced at a very high cost by the evaporation of sea water.

Improvement in the technology of mining and in the utilization of the minerals she does possess may do something to alleviate this situation, but even when this is allowed for, the best that can be said is that Japan is very poor in most of the important minerals needed in modern industry, while those she does possess are often of inferior quality and costly to produce. She must, therefore, import large quantities of many minerals and industrial crops such as cotton, wool, hides, and rubber if she is to develop her industries efficiently and on the relatively large scale essential to enable her to care for her population.

The situation in Japan as regards probable population growth and the domestic resources available for its support just outlined will go far towards explaining the inability of Japan to support herself under the Occupation, although the destruction of much of her industrial plant and the complete disruption of her foreign trade should not be forgotten in this connection. (In 1948 the United States supplied about 600 million dollars worth of goods to make up the difference between her exports and her imports. The 1949 figures are not yet available.)

JAPANESE FOREIGN TRADE IN THE FUTURE

Since any conclusions regarding the adjustment of Japanese population to resources must take account of the probable development of Japanese foreign commerce if they are to be of any value, I find it necessary to explain briefly my view of the probable development of her foreign trade. Although I am not a specialist in foreign trade I have given considerable study to the economic development of Japan over a period of more than 25 years. I believe that this knowledge furnishes a part of the indispensable background for judging the probable developments of this trade in the postwar world. One must also try to evaluate the world trends in foreign trade as they are developing today.

My general conclusion regarding the development of Japan's foreign trade during the ensuing decade is that there is little probability that she can become an exporter of manufactured goods and of services (insurance, shipping, etc.) on a scale large enough to enable her to buy the imports she must have in order to maintain even her present very modest level of living after the subsidy provided by the United States is withdrawn.

I fully realize that the expression of such a conclusion demands some further statement of the facts and reasons on which it is based. Obviously this cannot be done in any detail at this time, but I will very briefly outline the situation which seems to me to support this view. It seems to me highly improbable that any country which does not possess large foreign investments and which is not well equipped to supply many services to other countries can reasonably hope to support a considerable part of its population at a good level of living by foreign trade in the world of today. I do not believe that what Great Britain did in the way of supporting a rapidly increasing population at a rising level of living during much of the nineteenth century through her foreign trade can be repeated by Japan or any other land in the second half of the twentieth century.

There is no longer even a semblance of free trade between nations anywhere in the world. If Japan plans to sell large quantities of any kind of manufactured goods in the United States or any other country having a higher level of living and if she actually achieves large sales of particular types of goods for a time, it is practically certain that she will very shortly find tariff barriers and other restrictions being placed on this trade. Today no country with a well-developed industry of its own is willing to admit a considerable quantity of goods to compete with domestic goods where the ability to compete arises largely from the cheapness of labor in the exporting country. This is a fact which no one moderately familiar with world trade today will deny. If, on the other hand, Japan confines her trade largely to Asia and to other lands less industrialized than herself, the chief immediate question becomes: What volume of Japanese imports can these countries pay for, assuming that the colonial areas of prewar Asia will no longer give decisive preference to trade with the former governing power?

This change in the trade status of a number of Asiatic countries with the passing of colonialism should be of help to Japan in building up trade in this area, but it must be remembered that the incomes of the people of these backward industrial areas are pitifully small and that after they have purchased within their own countries the bare necessities of life they have almost nothing with which to buy foreign goods. On the whole, the war period has increased the poverty of the people of China, Indonesia, the Philippines, Burma, Indo-China, and Malaya. The Indians I have talked to believe that the same is true of their people. Besides, in spite of the fact that Japan's labor is cheaper than that of Europe and America, there are many types of consumption goods in the sale of which Japan cannot yet compete with these higher-wage countries. The possibility of the export of capital goods will be discussed separately since it is different from that of consumption goods in certain important respects.

The difficulty of Japan in developing satisfactory amounts of foreign trade with these nonindustrialized lands is further increased by the fact that two-way trade can seldom be made to balance satisfactorily. For example, there is no assurance that India possesses adequate amounts of the particular materials Japan needs in return for the manufactured goods she might be able to send to India. But this is, perhaps, not of decisive importance although the fact that there is an increasing tendency in the world today to negotiate bilateral trade agreements is a most serious development. I am not assuming that multilateral trade has gone, or will go, by the board, but I do believe that one of the most important questions we must ask regarding Japan's future foreign trade, or regarding that of any other country, must be very specific. They must deal with the kinds and amounts of goods that Japan can trade to each particular country in return for given amounts of iron ore, pig iron, bauxite, coking coal, manganese, cotton, sugar, jute, rubber, etc., which that country may have to sell. Such specific questions seem to me much more significant in the world today than the more general question: How much goods can Japan place on the world market and/or at what prices she can sell these goods?

I am not arguing that Japan cannot considerably increase her foreign trade in consumption goods, but I am saying that the growing tendency to negotiate bilateral trade agreements is additional hurdles for Japan to clear in her effort to expand her foreign trade and these hurdles are not so spaced that they can be cleared without loss of stride.

When, in addition to the matters already mentioned, one takes into account the growing trend towards autarchy all over the world and the increasing need of many European countries for larger trade in order to secure both food and raw materials, it seems practically certain that the competition for trade will be far keener than in the past. Because of these conditions it seems to me that one must remain highly skeptical of Japan's ability to increase her foreign trade sufficiently in the near fu-

ture to provide herself with food and raw materials adequate to maintain even the present level of living in a population increasing at about the rate indicated above.

Thus far I have considered primarily Japan's trade in consumption goods, although most of the factors mentioned will also operate with minor qualifications to impede the export of capital goods. In addition, trade in capital goods will encounter other serious obstacles. Any large import of capital goods into the less industrialized countries of Asia today must be financed to a considerable extent by loans and credits. Such a conclusion assumes that these countries will not be able to supply their own capital to anything like the same extent as the Soviet Union did after the beginning of their five-year plans since there is little, or nothing, to be squeezed out of their consumption without raising their death rates. Furthermore, the people in these unindustrialized countries live under conditions such that any increase in food and any increase in consumption favoring better health (lower death rates) is accompanied by a relatively rapid increase in population. It is highly doubtful, to say the least, that the raw material production in these areas will increase sufficiently rapidly to enable them to buy any considerable amounts of capital goods in addition to their consumption necessities. Besides, the large food exporters like Burma, are nearing the end of their surpluses.

In prewar years the capital goods in these countries were supplied largely through investment by Europeans and Americans and were directed chiefly to the production of those types of raw materials needed by the industrial nations and to the development of adequate transportation facilities. There was, of course, some capital put into consumption industries, and in India into basic industries, but this type of investment was relatively small. In view of the conditions likely to determine the purchase of capital goods, I do not see how these countries can buy much of such goods without large credits and loans and if, by any chance, they are able to follow the pattern of the Soviet Union, they will buy very little abroad in any event.

Large capital purchases abroad within the next decade can only take place, therefore, if large loans and credits become available.

Since Japan is not in position to extend loans and credits to the nations of Asia needing and wanting capital goods it is not likely that she can quickly develop any very considerable trade in capital goods. In the past the country which has supplied the credit has generally insisted on supplying the lion's share of the capital goods for which it was spent. I can see no indication that there will be any significant change in this respect in the near future even though we are developing new international financial agencies.

I would not be misunderstood. Japan can no doubt increase her resources significantly through trade as she did in the past. Malaya will take a certain amount of Japanese goods—textiles, bicycles, rubber shoes, flashlights, etc.—for iron ore, rubber, and tin. Burma will also trade rice for such goods and, the terms being changed to suit the circumstances, a similar trade with Indonesia, the Philippines, and other Asiatic countries should be possible. But it must be remembered that the buying capacity of these peoples is small and that the total volume of imported consumers goods they can take will be relatively small. Besides, there is increasingly keen competition in the sale of many types of goods which the industrially backward peoples wish to buy.

Furthermore, any change in the political and economic organization of these countries which might result in the import of a larger proportion of capital goods and a smaller proportion of consumers' goods, or which might lead to the diversion of a larger proportion of the national income into the domestic production of capital goods will almost certainly decrease the foreign trade of these countries for the time being.

On the other hand Japan's competitive position in foreign trade will be improved by a general increase in her industrial efficiency. That there is much room for such an increase in efficiency and that it will take place admits of no question. But

it is by no means certain that this improvement will be rapid or that it will be sufficiently great to enable Japan to meet European and American competition in many lines where good machinery, efficient labor, and good business organization can offset lower wages in maintaining low unit costs.

When considering the matter of improvement in the efficiency of Japanese production it is necessary to take account of the unusual need of Japan herself for new capital due to bombing and to recent progress in technology and to recognize that at the same time the new structure of her economy envisaged in the instructions to SCAP have badly disrupted the operation of Japanese industry and the processes developed in the past for the accumulation of capital. Foreign exchange is very difficult to come by in Japan. Under these circumstances the progress of rehabilitation will necessarily be slow. Japan will be in position to compete actively in world markets only after the United States and certain European countries have more or less re-established their trade. This delay will certainly increase Japan's trade difficulties during the next few years.

Finally, a word should be said about the new labor laws operating in postwar Japan. While these may be all to the good from the standpoint of developing a democratic spirit among the people, they raise many difficulties in practice and affect the efficiency and discipline of workers adversely for the time being. A revolution in labor-management relations such as is now under way cannot be effected without substantial loss in efficiency while it is in its early stages, however much it may conduce to greater efficiency in the future.

These considerations seem to me to make it extremely questionable whether the increase in productivity to be expected in Japan during the next decade and the expansion of foreign trade which should accompany it will be large enough to provide any substantial improvement in the level of living once the subsidy furnished by the United States is withdrawn. Indeed it seems to me that the increase in productivity to be expected will do very well if it provides for the increase in popula-

tion predicted above. The deficit is likely to remain about as large as at present or even to increase, if the present level of living is maintained. I realize fully that this is only my opinion and that I am dealing in terms of probability when speaking of the future, but I have done the best I can to assess these probabilities reasonably and come out with this conclusion as regards the way in which the increase in productivity and the expansion of foreign trade are likely to affect living conditions in Japan if the population grows as now appears likely.

But, of course, greater production and trade are not the only factors which might affect the level of living by changing the relation between population and resources although I believe they are by far the most important factors. Many Japanese are greatly interested in emigration as a factor which may reduce the pressure of population on resources. They point out that in Europe rapid population growth and improvement in the level of living were in part made possible by emigration to new lands. They ask why Japan cannot send out large numbers of people to new lands to which Japanese manufactures may then be sent and from which colonial goods will be exported to ease the pressure of population on resources in the home land. The answer to such a question seems to me fairly obvious if we confine our attention to the next few years. The unused lands in which extensive settlement is possible to the Japanese are far smaller than those open to Europeans in 1750. They are largely tropical lands with only a primitive political and economic organization. They possess no large and well organized facilities to care for immigrants, either those going into agriculture or those desiring to go into industry.

Emigrants from Japan to the unused tropical areas of the world today would either have to start from scratch as did immigrants to America in the early years of settlement, or for several years be largely supported from home in communities developed by imported capital. Moreover, the health hazards of the Japanese going into New Guinea or other tropical areas today would probably be considerably greater than those faced

by the people who went into the Americas even as early as 1700 unless large public health works were undertaken in advance. It should also be remembered that until about 1825 when the United States had a population of approximately 11 million the total number of immigrants entering the United States in any one year never exceeded a few thousand. It takes decades of settlement to build up a population and a social and political organization in a new land capable of absorbing hundreds of thousands of immigrants annually even when resources are ample. As late as 1913 the United States absorbed only from three-quarters of a million to one million immigrants annually when economic conditions were at their best.

In order to secure any substantial relief of her population pressure through emigration Japan must send out hundreds of thousands of people each year and it is not reasonable to expect that emigration on this scale can be achieved in less than two or three decades even with the wholehearted encouragement of the Japanese government and the United Nations and with very substantial financial support from outside sources. Japan would have had to send out 4,500 emigrants every day during 1948 in order merely to prevent her population from increasing. This is equal to a fairly large Japanese agricultural community.

In addition, in the case of Japan there are other difficulties which appear insuperable at present. Owing to the aggressiveness of the Japanese in the past, no country is willing to admit any appreciable number of them at present, and this applies equally to the colonial areas still under European control; nor does it seem likely there will be any change in this attitude in the next few years. At best, only a small number would be allowed anywhere in the world today and, as said above, we must think in terms of a million and a half or more annually if Japan is to obtain substantial economic relief from this source.

Although at the moment Japan has achieved a death rate so low that substantial emigration could be expected to reduce

the rate of natural increase rather than merely to reduce the death rate further, this condition may not hold good for long. The sudden withdrawal of the subsidy being supplied by the United States might result in raising the death rate substantially. If this were to happen, emigration on a large scale would probably only result in a lower death rate and have little or no effect on the rate of population increase. The important point to remember is that emigration from a crowded country having a high birth rate and death rate usually has little effect on the growth of population in the home land since the reduction of the death rate due to the momentary easing of the pressure raises natural increase at home. But, as just noted, with Japan's present death rate a large emigration would probably reduce the rate of population increase. It would have to be an incredibly large emigration, however, to effect any substantial lowering of the actual population at home.

It seems to me, therefore, that emigration offers no hope of significant relief from the increase in economic pressure in Japan. This pressure is likely to increase rather than decrease. However, I have long believed that the granting of the right to emigrate might have beneficial psychological effects upon the relations between nations even where the exercise of the right by any appreciable number of persons in the crowded nation was impossible. I would, therefore, favor giving the Japanese limited rights of emigration although I do not believe they will be able to exercise these rights to an extent sufficient to make any appreciable difference in the pressure of their population on their resources.

It will be abundantly apparent by this time that I do not believe the means of relieving the pressure of population on resources which have been discussed above will do a great deal to help Japan within the next decade or two. I do not see how increased productivity, expanded foreign trade, and emigration can add to the per capita production of the Japanese enough to improve their level of living substantially as long as their numbers increase from 1.0 per cent to 1.5 per cent per year.

It actually has averaged about 2.0 during 1947-49. The only solution of their problems of improving their level of living, or even of maintaining the present level, is to adjust the rate of population growth to the actual increase in production. I have indicated above that I believe the rate of population growth will probably fall from the 2.2 per cent of 1948 to 1.0 per cent or 1.2 per cent in the next ten years. But I do not believe this is fast enough or will occur soon enough to permit a substantial increase in per capita production under the conditions prevailing today and likely to prevail in the next few years.

In the United States we talk about an increase in productivity of 2-3 per cent a year as being very good although we have abundant resources and capital and a large and experienced personnel, both in management and in labor. Japan lacks all these except an abundance of labor and the majority of her workers are not yet highly experienced in modern industrial processes, and her experienced farmers cannot add new acres for production. Is it reasonable to believe that under these circumstances the productivity of Japanese industry and agriculture can increase at a rate equal to that which seems probable in the United States? I do not believe that it is. Hence, I find myself highly skeptical regarding the outlook for the future of Japan. As a man of humane sentiments, I hope that the conclusions expressed above are wrong in two respects: (1) that I have magnified the difficulties Japan will encounter in increasing production and foreign trade and emigration, and (2) that I have underestimated the speed with which the Japanese will reduce their birth rate. However, when I try to weigh objectively the probabilities I do not believe that I have made these errors. Hence, I find myself very apprehensive regarding Japan's future. A real catastrophe involving millions of persons may be in the making and it may very well be precipitated by the rather sudden withdrawal of American support from the economy of Japan before the Japanese have been able to make any workable adjustment of population to resources.

ANNOTATIONS

AMERICA'S HEALTH¹

THE National Health Assembly which met in Washington in May, 1948, was convened at President Truman's request for the purpose of drawing up a ten-year plan for expanding the health resources of the nation and raising the health standards of the entire population.

The assembly was divided into fourteen sections, each of which discussed an important problem of health. The members of each section were carefully selected on the basis of familiarity and expertness in the particular field of discussion. Professional and voluntary organizations from all geographical areas were represented in each of the sections.

What is the Nation's Need for Health and Medical Personnel? The problem of personnel was considered as basic to any plan for attaining a higher level of health in the United States. In this section attention was centered upon the present supply and future demand for physicians, nurses, and dentists, and the means of meeting that demand.

The need for strengthening and expanding facilities for academic and supervised field training in medical and public health techniques and administrative practice was emphasized. Rapidly developing areas of specialization which were found to need greater recognition in training, were mental hygiene, nutrition, pediatrics, and physical medicine. The shortages in trained personnel were found to be proportionately greater in mental hygiene than in any other specialized field. This field includes psychiatrists, clinical psychologists, psychiatric nurses, and psychiatric social workers.

¹ AMERICA'S HEALTH—A REPORT TO THE NATION BY THE NATIONAL HEALTH ASSEMBLY. New York, Harper & Brothers, 1949, 388 pp.

It was pointed out that maintenance of an adequate supply and quality of medical personnel involves the pressing problem of financing medical education. Possible sources for additional financial support were listed as: (1) private contributions; (2) state and community appropriations; and (3) federal appropriations. This problem is one that will no doubt need continuing study and consideration.

The Nation's Need for Hospital Facilities, Health Centers, and Diagnostic Clinics. According to the report of this section, hospitals have gone through several developmental stages. "In the first, the hospitals provided meager care almost exclusively for the sick poor. The second stage witnessed the hospital's evolution into the workshop of medicine to which the sick and injured came largely for curative measures. In the third stage, which has already begun, the hospital should become more and more an important health agency, not only in providing the best in therapeutic measures but also in taking active steps toward the prevention of illness." Two functions, preventive medicine and public health education, it was thought, should be added to the traditional functions of the general hospital.

The need for formal training in hospital or institutional administration for those responsible for hospital management was discussed but no recommendations were made concerning this point. In view of the fact that the economic stability of the voluntary hospital is being threatened by decreasing endowment income and rising costs of operation, the need for hospital management to be on a more businesslike basis seems imperative.

The program under the Hospital Survey and Construction Act was endorsed by the group. It was recommended that the authorization of \$75,000,000 per year should be increased to meet urgent needs for more facilities in many areas of the country.

A National Program for Mental Health. In this section attention was centered on assessing existing resources of facilities and personnel, on determining the most urgent needs for developing a nation-wide mental health program, and on indicating lines of action leading toward the goal of adequate services and facilities to serve the entire population.

At the end of 1946 the prevalence of patients in mental hospitals was reported as 382 per 100,000 population. It was recommended that hospital facilities be expanded to a total bed capacity of 5 per 1,000 population. Even with the present bed capacity of approximately 3.8 per 1,000, it was indicated that there is a shortage of personnel—attendants, nurses, and psychiatrists.

The need for research to determine the extent of the problem of mental health was pointed out as basic to planning for adequate facilities for a mental health program.

What Can be Done to Improve Nutrition? In the last quarter century, knowledge of nutrition has advanced so rapidly that it has outmoded programs and methods of instruction in medical and public health schools, and has revealed the inadequate administrative machinery set up for its public application by federal, state, and local governments.

This section outlined a national policy concerning nutrition. Two of the recommendations were:

1. The resolutions and recommendations adopted at the United Nations Conference on Food and Agriculture in 1943 should be supported and implemented.
2. It is urged that a National Nutrition Council, of the type recommended in the Final Act of the United Nations Conference on Food and Agriculture, be organized . . . to exchange information and experience with comparable organizations in other countries and to cooperate with and through the United Nations and its specialized agencies.

Other recommendations were concerned with: (1) organization and administrative programs through national, state and local agencies (both official and nonofficial); (2) research in nutrition, including perfection of better methods of appraisal of nutritional status, establishment of qualitative and quantitative human requirements of the essential nutrients and basic foods; (3) professional education in nutrition; and (4) public education in nutrition.

The role of nutrition in a national health program is set forth in the following statement:

The problems of nutrition are among the most important af-

fecting this nation's health. Nutrition must take its place along with other preventive programs to raise the health of the people and to promote sounder bodies, greater happiness, and longer life. Much can be done in this country and throughout the world to improve nutrition. Much must be done if we are to set realistic and attainable goals.

What Can be Done to Improve Dental Health? Dental diseases afflict more than 90 per cent of the people. This statement epitomizes the problem discussed by this section.

The goals to be reached by dental health programs during the next decade were specified as follows:

Prevention of dental diseases through the application of effective preventive techniques,

Control of dental diseases by making dental treatment and dental health education available to every child as rapidly as resources will permit,

Increased facilities for dental care in all hospitals and health centers,

Improved distribution of dentists between urban and rural areas and an increase in the number of qualified dental practitioners,

Training and utilization of additional auxiliary personnel—dental hygienists, dental assistants, and dental technicians.

Specific recommendations were made for attaining these goals.

Chronic Disease. Only in the last five years has there been a general effort to improve care of the chronically ill. Public health agencies are beginning to recognize the fact that chronic disease is becoming a major public health problem because of the aging of the population. Consequently, this problem was the topic of one discussion group.

Recommendations were made concerning the needs for institutional and noninstitutional care of the chronically ill. The importance of rehabilitation programs as an effective means to bring about a more normal and useful work life for the chronically disabled person was considered.

Physical Medicine and Rehabilitation was also a subject of

group consideration. It was the thought of this section that rehabilitation should be available to the mentally and physically handicapped, and should not be confined solely to the restoration of persons to employment. The recommendations outline a broad and comprehensive program which is to be integrated with other medical services.

As a result of the discussions of the section on the *Nation's Need for Medical Care*, the following broad principle was set forth:

Adequate medical care for the prevention of illness, the care and relief of sickness, and the promotion of a high level of physical, mental and social health should be available to all without regard to race, color, creed, residence or economic status.

Differing views were expressed as to whether this principle should be effectuated by means of voluntary or compulsory health insurance.

Evidently more time is needed for experimentation with various types of medical care programs before a general consensus of opinion can be formed. Winslow² in a brief article in *The American Journal of Public Health*, gives some timely suggestions on this point.

Recommendations were made to implement national programs for maternal and child health and for rural health. Other problems discussed include the nation's need for local health units, standards of environmental sanitation, more effective state and community planning, and medical research.

There were two points which were stressed in virtually every section. These were the need for more and continuing research in the particular field of discussion and the need for some form of financial assistance from the federal government to aid in the relief of acute shortages of facilities and of personnel.

This volume is timely and should be widely read because it represents a forecast of what our future health program should be.

JEAN DOWNES

² Winslow, C.-E. A.: Directed Gradualism in the Field of Medical Care. *American Journal of Public Health*, January, 1950, 40, No. 1, pp. 77-78.

PUBLICATIONS ON INTERNATIONAL ECONOMICS¹

RECENT interest in international economic problems has been shown by the appearance of considerable literature on the subject. A number of studies in this field have been made by the United Nations and various universities. This review presents a digest of five recent reports, two published by the United Nations and three by university presses.

Programs of economic development in various parts of the world provide the subject for two publications: "The Underdeveloped Areas: Their Industrialization," written by John H. Adler and published by the Yale Institute of International Studies, and *TECHNICAL ASSISTANCE FOR ECONOMIC DEVELOPMENT*, prepared by the Secretary-General of the United Nations in consultation with the executive heads of several specialized international agencies.

Adler gives a general report on the present stage and economic implications of industrialization of underdeveloped countries in Latin America, Asia, Africa, Oceania, and Eastern Europe. He states that production indices show that in the past twenty years physical volume of manufacturing production has approximately doubled in most underdeveloped countries for which data are available. However, Adler suggests that on the whole no progress has been made in narrowing the gap in industrial output and capacity between the underdeveloped areas and the more industrialized countries because the more industrialized countries have also made great advances during this period.

¹ Adler, John H.: *The Underdeveloped Areas: Their Industrialization*. Yale Institute of International Studies, Memorandum 31, New Haven, Connecticut, March 31, 1949. 30 + iv pages.

United Nations, Secretary-General in consultation with executive heads of interested specialized agencies: *TECHNICAL ASSISTANCE FOR ECONOMIC DEVELOPMENT*. United Nations, Lake Success, New York, May, 1949. 328 pages, \$2.50.

United Nations, Secretariat of the Economic Commission for Asia and the Far East: *ECONOMIC SURVEY OF ASIA AND THE FAR EAST 1948*. Department of Economic Affairs, United Nations, Lake Success, New York, 1949. 289 pages, \$2.00.

University of Texas. Institute of Latin-American Studies: *POLITICAL, ECONOMIC, AND SOCIAL PROBLEMS OF THE LATIN-AMERICAN NATIONS OF SOUTHERN SOUTH AMERICA*. Papers read in a lecture series. Latin American Studies VI. University of Texas Press, Austin, Texas, 1949. 107 pages.

Kaplan, Jacob J.: *Economic Stagnation in Italy?* Yale Institute of International Studies, Memorandum 32, New Haven, Connecticut, May 10, 1949. 30 pages.

Drives for great increases in industrialization are now under way in many of the underdeveloped countries. In part, they are an outgrowth of desire of underdeveloped areas for greater economic independence. The new drives are characterized by general emphasis on heavy industry and power generation. Many of the projects, such as plans for electrification or irrigation, provide limited expectations for immediate financial return. As a result government funds may often be needed.

Adler suggests that industrialization plans may cause two economic difficulties for underdeveloped areas: inflationary pressure and an unfavorable balance of trade. Inflationary pressure is likely to arise for several reasons. For example, the supply of voluntary savings available for investment purposes is small in most underdeveloped countries, and imperfections of the capital market make it difficult to obtain use of savings which do exist. Faced with limited funds many countries will probably finance industrialization plans in part by inflationary expansion of credit. Further, in the process of industrialization manpower tends to be drawn from low productivity agricultural work into more productive urban employment. This is likely to result in rises in income followed by increases in demand for consumer goods. The shift of population from rural to urban areas may accentuate the increased consumer demand and lead to additional capital outlays, especially for housing. Presumably the new demand will exert upward pressure on prices.

The balance of payments is likely to be adversely affected by several factors. For instance, imports of investment goods will probably be needed for industrialization purposes. In addition, secondary demand for imports can be expected to rise as a result of: (1) expansion of income, (2) increased urbanization since persons who live in cities have a greater propensity to import than persons living in rural areas, and (3) price rises in domestic goods which tend to give an advantage to foreign products in competition with domestic output. Finally, the volume of exports may decrease if the higher income of industrial workers is spent for food and other domestic products that might have been sent to other countries. It should be noted in this connection that present industrialization plans do not in themselves tend to make new products available for immediate

export. Adler believes that the foreign exchange problem is one of the "crucial limiting factors" for investment plans of underdeveloped areas. He suggests that countries with extensive industrialization plans may have to continue use of exchange controls—contrary to recent international agreement.

The study by Adler provides valuable factual and theoretical material which furnishes a background for judging proposals for industrialization of underdeveloped areas. Attention is limited primarily to economic aspects of the programs. Problems of a rather technical nature are explained in a very understandable way although one wishes at times that more consideration had been given to possible differences in short-run and long-run effects of industrialization. The report is very timely in view of the great interest now being taken in advancement of underdeveloped countries.

The United Nations report gives details of an extensive proposed program for international assistance to local areas in development of plans for increased production and greater human welfare. Suggested forms of aid include sending advisory missions, providing training opportunities, furnishing direct help in operation activities, doing research to evolve suitable production methods, and disseminating technical information.

International assistance would be furnished by the United Nations and various specialized international agencies including the Food and Agriculture Organization; the International Labour Organisation; the World Health Organization; and the United Nations Educational, Scientific, and Cultural Organization. Assistance would be provided to local areas upon their request, and would be given to or through individual governments. Receiving countries would be expected to assume considerable responsibility for administration and costs of the plans. Working relations between receiving countries and international agencies and among the international agencies would be strengthened to provide for coordination of plans for economic development. Proposed expenditures for the United Nations and the specialized international agencies were \$35.9 million for the first year and \$50.2 million for the second.

The report suggests that primary emphasis of plans for economic development be placed on improvement of agriculture

and expansion of industry. For agriculture proposals include land management; increased crop and animal production by such measures as distribution of seed, better animal breeding, and control of disease; and economic services, including development of credit systems and marketing plans. In industry suggestion is made for concentration on production of capital goods in some areas, and emphasis on production for current consumption needs in others. In the labor field programs are proposed for migration, industrial relations, labor statistics, and social security.

Plans are also proposed for health and education. For health they include elimination of reservoirs of communicable disease; promotion of positive health along special lines such as maternity, mental health, and nutrition; and improvement in environmental sanitation. In education they include provision for better school facilities, scholarships and fellowships, research, and books.

Numerous other programs are proposed in the United Nations report. In our present stage of progress some of them are idealistic and probably will not be adopted on an extensive scale in the immediate future. However, the report makes the valuable contribution of presenting suggestions for future activity made by leaders in international affairs. Backed by the actual assistance of international organizations, such suggestions are an important means of encouraging underdeveloped areas in social and economic advance.

Economic conditions in particular areas are discussed in three studies: (1) *ECONOMIC SURVEY OF ASIA AND THE FAR EAST 1948* prepared by the Secretariat of the Economic Commission for Asia and the Far East for the United Nations; (2) *POLITICAL, ECONOMIC, AND SOCIAL PROBLEMS OF THE LATIN-AMERICAN NATIONS OF SOUTHERN SOUTH AMERICA*, a collection of papers presented in a lecture series on this subject held by the University of Texas in 1948; and (3) "Economic Stagnation in Italy?" written by Jacob J. Kaplan and published by the Yale Institute of International Studies.

In the *Survey of Asia and the Far East* emphasis is placed on post-war changes in the area. The region studied consists of British North Borneo, Brunei and Sarawak, Burma, Ceylon,

China, Hong Kong, India, Indochinese Federation, Indonesia, Japan, Korea, Federation of Malaya and Singapore, Pakistan, Philippine Republic, and Siam. General changes noted in the region include decline of colonialism, increased economic planning and control by the government, and a movement toward greater economic equality by such means as agrarian reform and labor legislation. Specific changes found in the fields of production, monetary and fiscal affairs, and international trade are described in the paragraphs which follow.

Production. Production in 1948 was generally below prewar (usually 1934-1938 or 1935-1939) levels in spite of improvements during the year. Production of major food crops was close to prewar but information available for a few countries suggested that the fish catch was still far below prewar. Continued shortages of work animals delayed agricultural recovery. In approximate figures production of coal was 70 per cent of prewar; of cement, 50 per cent; and of iron ore, one third. Limited recovery of the iron and steel industry was an important factor in the low level of industrial output.

Monetary and Fiscal Affairs. Note issuing authorities and central banks received greater powers in post-war years. State control of both increased. Despite improvement in banking facilities lack of finance remained a serious hindrance to agricultural and industrial development.

In post-war years budgets of war devastated countries were relatively low in terms of prewar prices; budgets of countries not directly affected by the war showed continuous expansion compared with prewar. In some countries defense expenditures increased in relative magnitude in the total budget and considerable attention was given to use of government funds for economic development. Indirect taxes, especially customs duties, remained a primary source of revenue. However, after the war income taxes assumed greater importance in several countries, notably India and Japan.

International Trade. Large post-war trade deficits replaced prewar export balances. Marked improvement during 1948 suggested that many of the changes would be transitory with the exception of limited world demand for rubber, natural silk, and tin metal produced in the region. However, in 1948 exports of

rice, fats and oil, sugar, and jute remained generally far below prewar.

In most countries in the region imports from the United States rose sharply relative to other imports between 1937 and 1947. In the same period trade—especially exports—of several countries with the United Kingdom declined. Probably as an answer to the dollar shortage the proportion of imports from the United States declined in nearly all countries in the area during 1948. In the same year trade of the region with the United Kingdom showed a marked increase.

A wealth of additional statistical data on prewar and post-war economic conditions in the area is given in the survey. Also, more attention is devoted to the demographic implications of modernization than in the other reports under review. It is noted that "Whereas the application of technical knowledge is likely to have a great effect in reducing the death-rate, there is no reason to expect an immediate effect on the birth-rate," which is closely related to social institutions and customs that cannot be easily changed. The probable result is therefore an acceleration of population growth. This point suggests that due consideration should be given to the formulation of satisfactory population policies when plans are made for increased industrialization.

The publication on southern South America includes an interesting article on the regional economy of the area written by William L. Schurz. For purposes of his study, southern South America consists of Argentina, Chile, Paraguay, Uruguay, and Bolivia.

Schurz indicates that a traditional basis of economic life for the Latin-American republics—exports of raw materials in exchange for imports of manufactured articles—has been greatly disturbed in recent years. The international trading position of Latin America has been weakened by such factors as wars; use of substitute materials by manufacturers which threaten the future of such industries as rubber, copper, and sodium nitrate; development of competitive sources of supply in Africa, Indonesia, and other parts of the world for staple export products of Latin America; and reorientation of trade channels as a result of bilateral agreements between countries outside Latin Amer-

ica or preference arrangements of colonial powers, such as England has made with the British dominions.

Two types of measures have been adopted in Latin America to meet the new international situation: greater industrialization, and increased trade within the area. Schurz states that Argentina and Chile have made great progress industrially and Uruguay has embarked on an ambitious program to industrialize. He indicates that industrialization in Latin America has not always proceeded along lines giving sufficient attention to economic reality, such as availability of private capital and raw materials and the stage of economic development.

Schurz notes certain increases since 1938 in the importance of trade between individual countries of southern South America relative to total trade of the countries. However, he concludes that the economies of the region are largely competitive rather than complementary and the nature of trade relations in the area does not favor a comprehensive scheme for economic integration.

The publication on southern South America includes other articles which are concerned with problems in particular countries. The content of the articles is partially indicated by the titles, such as "Chile Today and Tomorrow from the Social and Economic Viewpoints," "Uruguay and the Proposed Basic Agreement for Inter-American Economic Co-operation," and "Political Events and Governmental Changes in Argentina, 1943-1948."

In the study of Italy, Kaplan describes recent economic difficulties in that country and evaluates post-war economic aims of the European Recovery Program and the Italian government in the light of these difficulties. He presents an interesting discussion of the importance of economic improvement if democracy is to survive there.

Kaplan notes that at the end of the war Italy was faced with an acute shortage of consumer goods and raw materials. Industrial production stood at only 15 to 20 per cent of the 1938 level. In post-war years imports were inadequate and private investment in long term projects was low. During 1946 exports increased rapidly to meet foreign demand and by the fall of 1947 industrial production reached 82 per cent of the 1938 level.

Contrary to the situation in other European countries unemployment persisted. Beginning in late 1947 unemployment increased, production fell, and a general depression took place. The serious nature of the depression was indicated by the fact that it occurred in spite of the presence of favorable conditions in the economy, such as available raw materials, high export demand, and the prospect of balancing the foreign payments account. Kaplan points out that the improvement in the Italian balance of payments position "underlines the paradox of domestic depression in the face of world recovery."

In a discussion of the situation, Kaplan suggests that the private sector of the Italian economy is not "geared for expansion." He states that for several decades the industrial system of the country has been characterized by greater interest in monopolistic restriction than in competitive quest for maximum profits. Under Fascism cartel agreements, tariff restrictions, and government favors became typical ways of attaining success in business. To a large extent expansion of capacity was accomplished by direct government investment. The distribution of income and falling level of real wages under Fascism did not provide the basis for expecting rising domestic demand. Kaplan states that the "Italian business community has come to regard the high rate of population increase as a cause of low real income per capita rather than as a source of increased demand, and to base its hopes for expansion on the willingness of foreign markets to absorb more of its products." He continues by pointing out that by acting on such anticipations the business community assures the failure to expand.

Kaplan believes that increased investment—as a means to rising national income and declining unemployment—is a central answer to the problem. He suggests that the government undertake a positive program in which it is prepared "to abandon its balanced budget program for as long as seems necessary" to attain goals it has set for production and investment. Types of measures which might be adopted include easy credit, subsidies, tax penalties or abatements, direct government investment, price regulation, raw materials allocation, and guaranteed government purchase of program output exceeding market demand.

This publication performs the important service of presenting a unified description and analysis of the post-war economic and political situation in Italy. Some persons might oppose the extensive government program which Kaplan favors. However, it is in line with much recent economic thought. For persons who believe that economic welfare in a country is basic to success of democratic institutions, the report presents an interesting case study.

ELIZABETH H. JACKSON

